THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXIX. No. 1776.] LONDON, MAY 25, 1897. [49TH YEAR. PRICE 6d.

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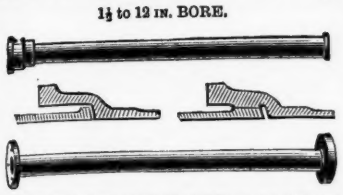
1½ to 12 IN. BORE.



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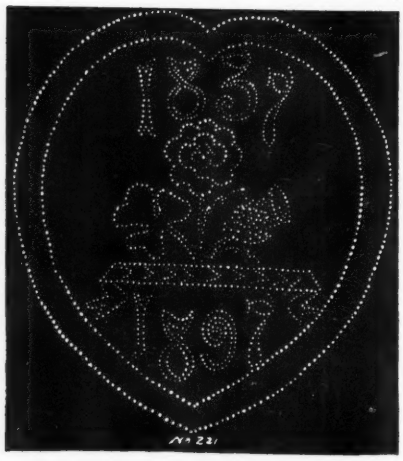

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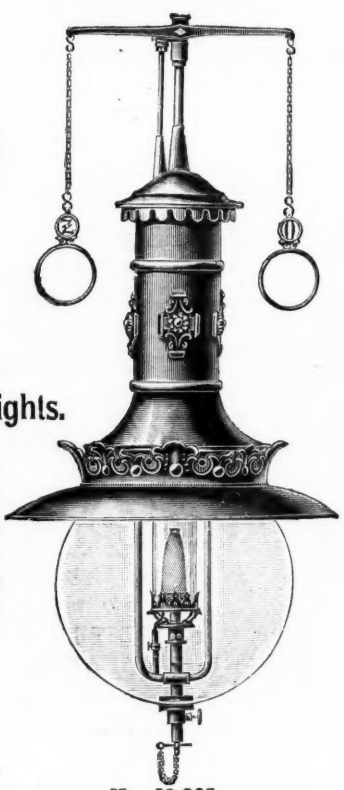

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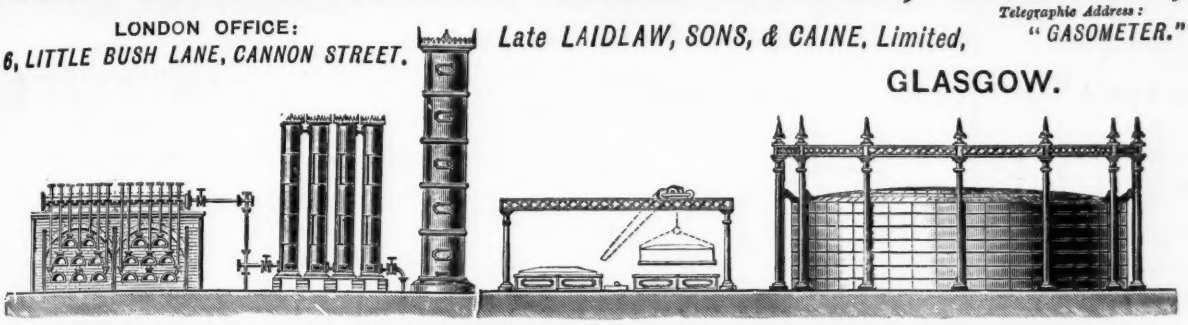

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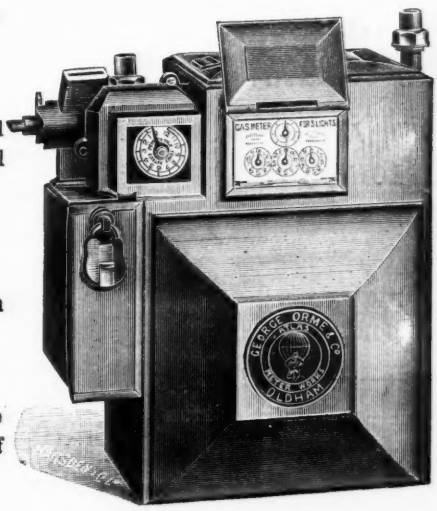

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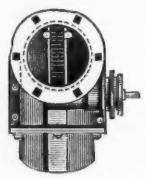

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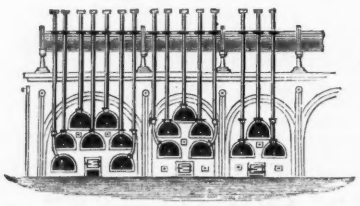

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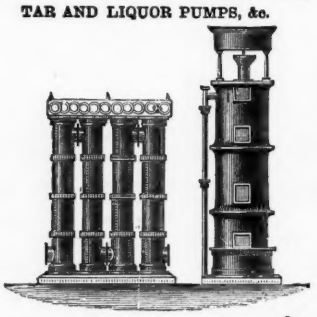

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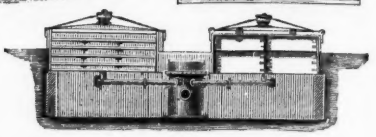

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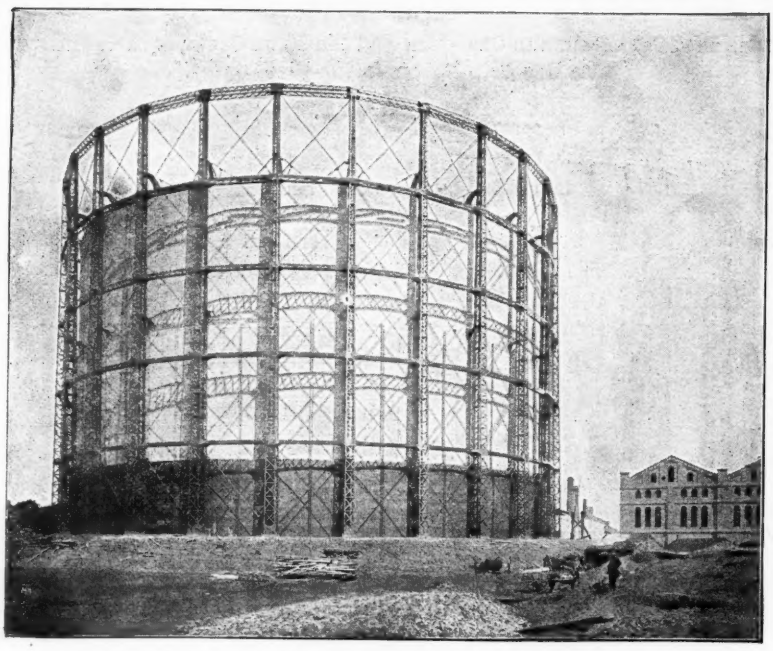

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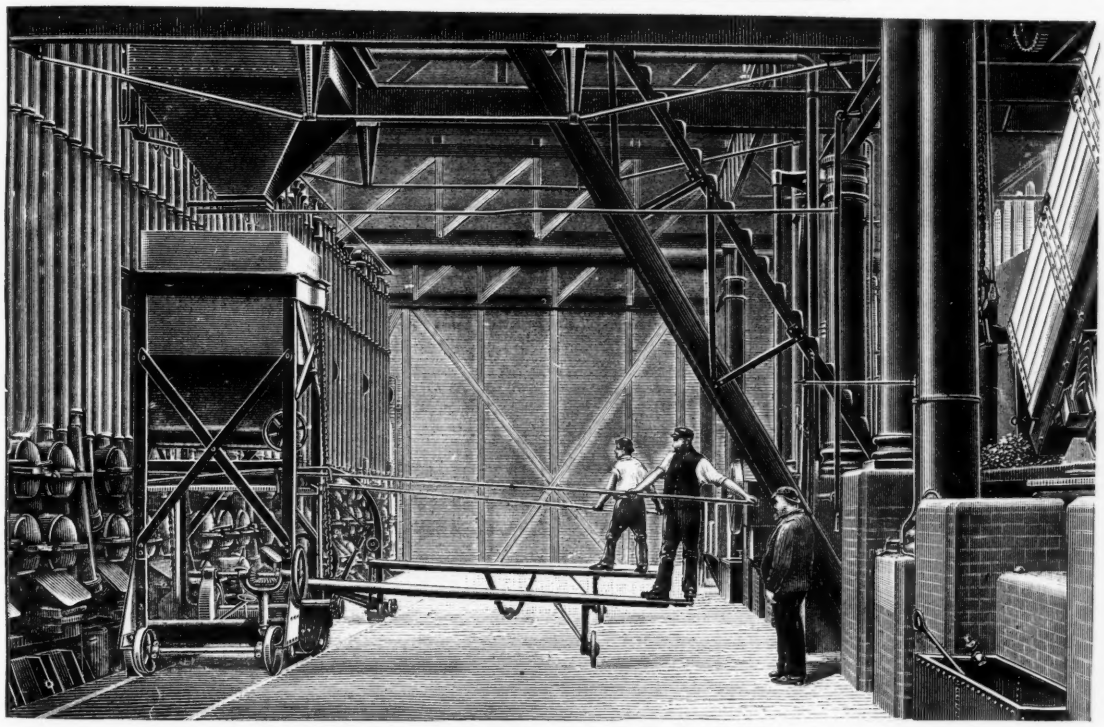

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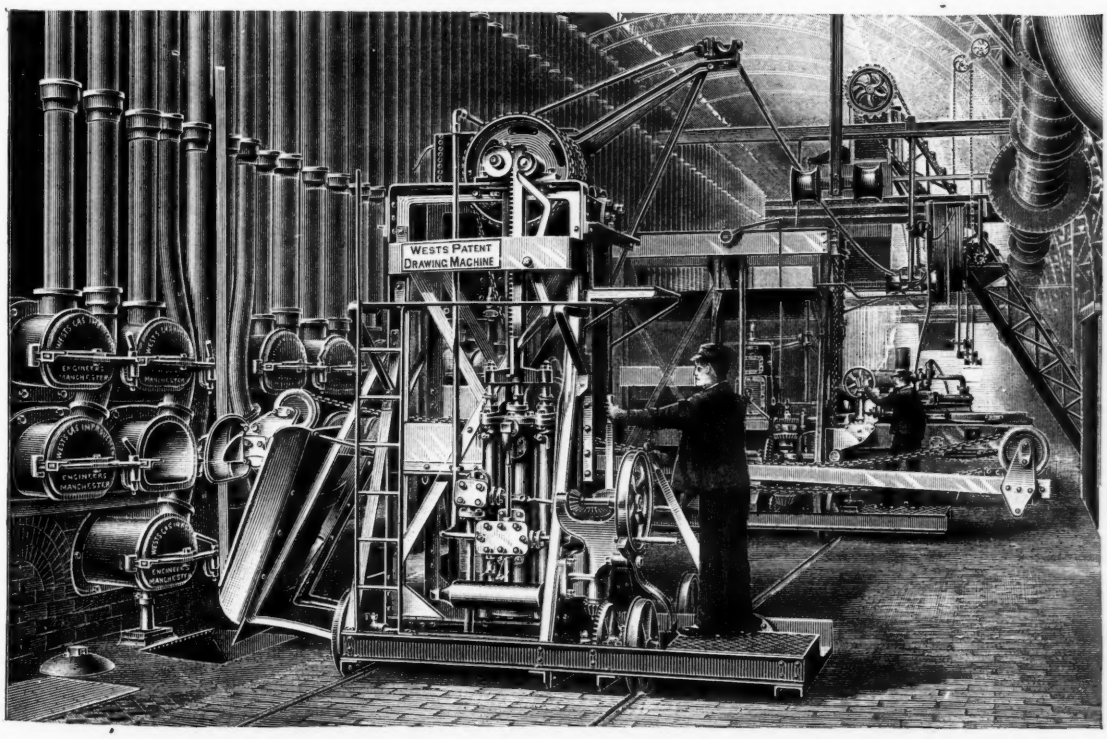

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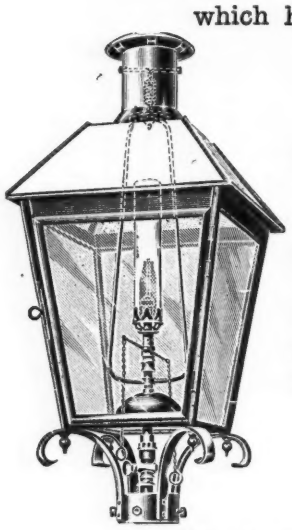

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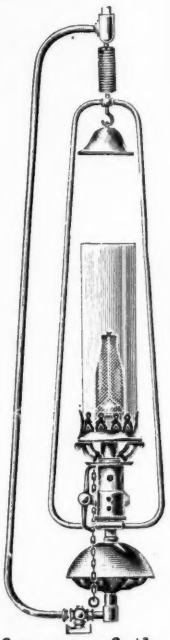

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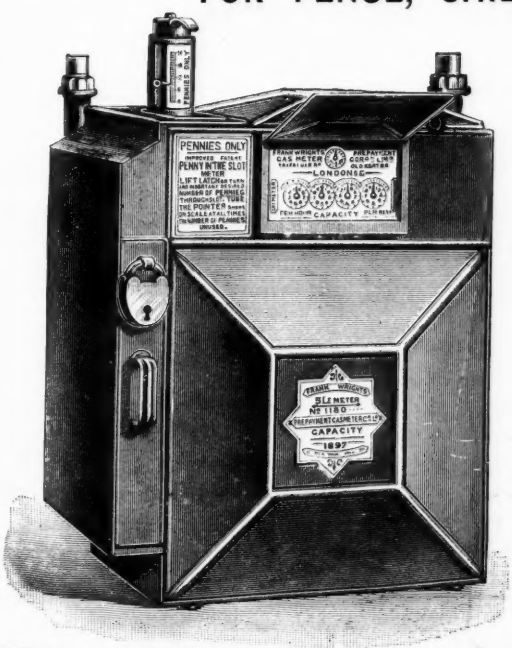

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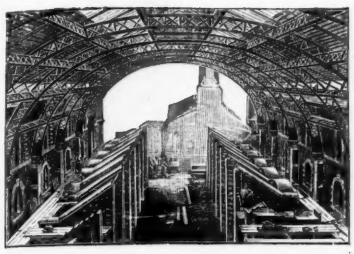

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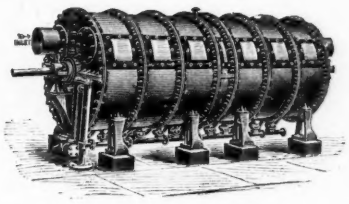

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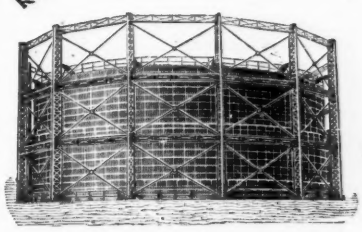

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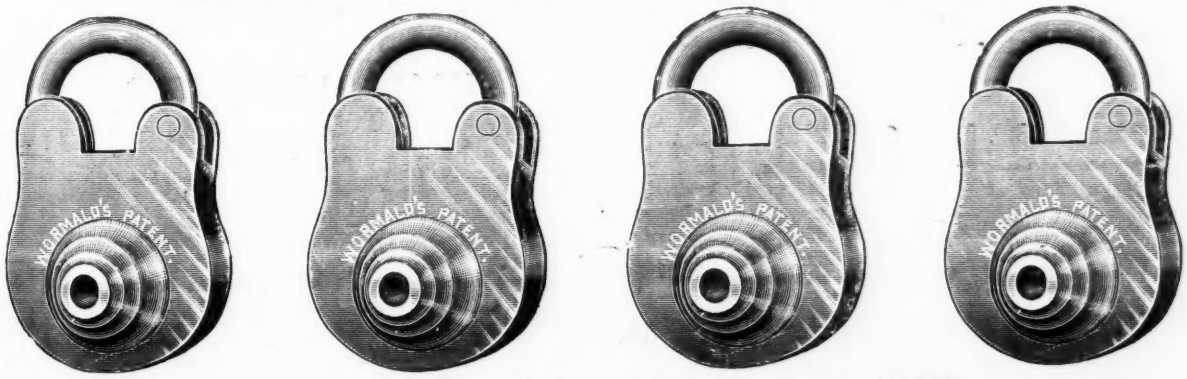

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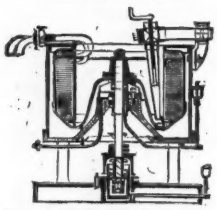

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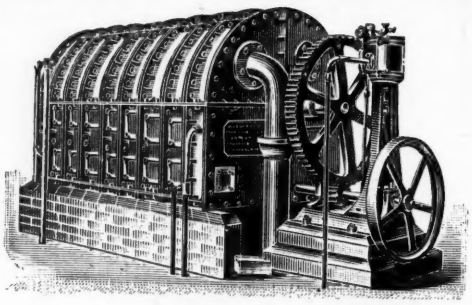

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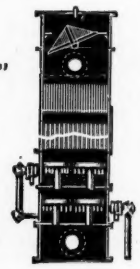

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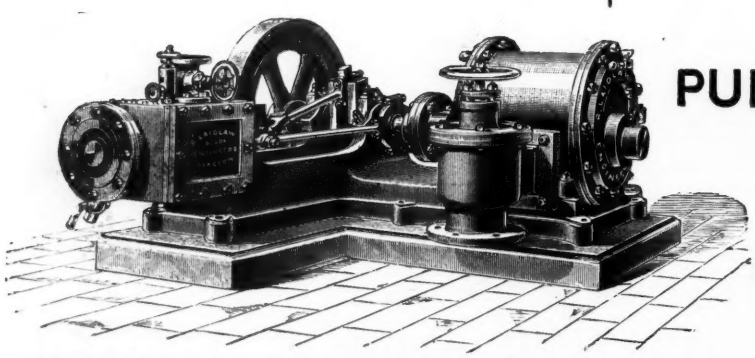

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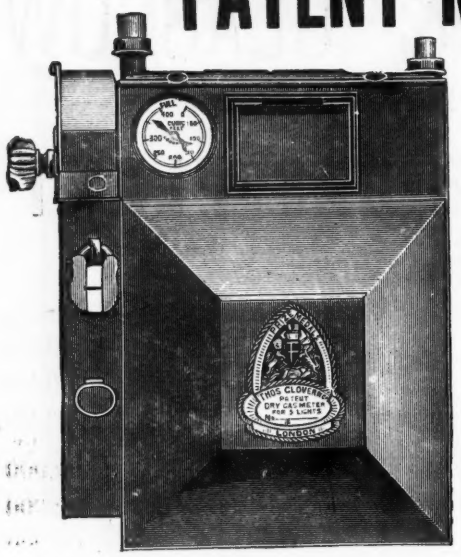

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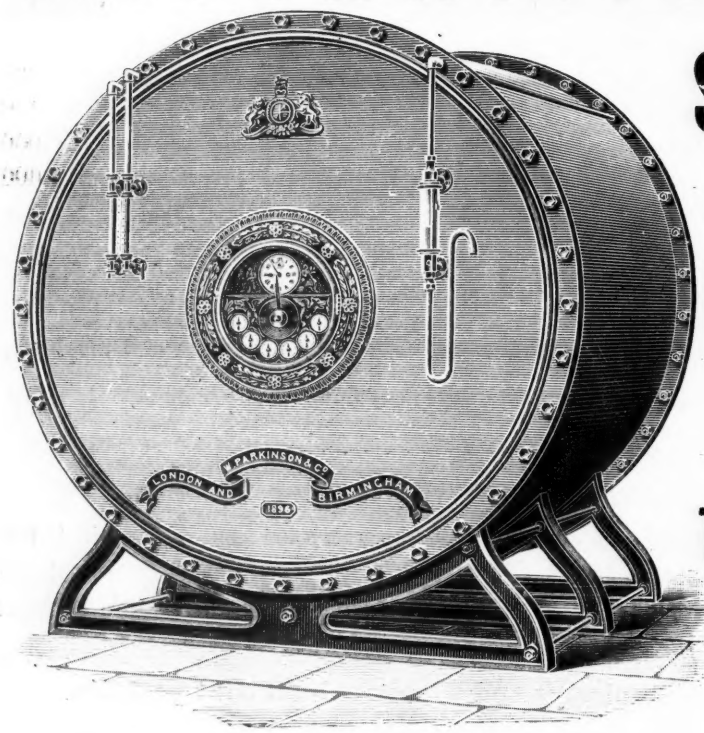

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EDITORIAL NOTES.

Second Reading of the Workmen's Compensation Bill.

THE second reading of the Workmen's Accident Compensation Bill by the House of Commons without a division, is an exceedingly satisfactory performance, inasmuch as it leaves the way open for full and unprejudiced consideration of the clauses in Committee. The debate on the second reading was of great interest, and brought out a number of points for and against not only this particular measure, but also illustrative of the hazards of any possible scheme of legislation of the kind. There are many large employers of labour in the House of Commons; and, with scarcely any important exception, they joined with the representatives of the labour interest in welcoming the Bill as an honest and well-conceived attempt to carry into practical effect the common agreement of all orders of the community that the law of employers' liability ought to be amended. The gravest objection to the Bill was raised by the colliery interest. Mr. Bainbridge asserted that it would increase the cost of producing coal in Lancashire and Cheshire by 2d. per ton; while in the counties of Northumberland and Durham alone an additional burden of £200,000 a year would be put upon the colliery owners. Mr. Seton-Karr supported this statement; and although Sir James Joicey spoke very guardedly, and accepted the principle of the Bill, he described it as more socialistic in character than any measure that had been submitted to the House during the last half century. Sir A. Hickman, on the other hand, said that, as an employer, he warmly congratulated the framers of the Bill. In his very able speech, Sir A. Hickman fully admitted that the proposals of the Bill would lay a serious burden upon some industries, especially that of coal, but he professed his willingness to accept his share of the burden because he believed it would have a tendency to diminish litigation. Many members having averred that the Bill would prove fatal to mutual and friendly societies and trade unions, Sir A. Hickman pointed out that it was quite as reasonable to believe that it would be of great assistance to such bodies in relieving them of many of their burdens, and leaving them free to deal with questions of sick relief and old-age pensions for their members. On the general question of the tax which the Bill might lay upon the industries affected by it, Sir A. Hickman finely said: "An industry that would not "bear the natural burdens that pertained to it was an in-"dustry that was not worth carrying on."

It was to be expected that the question of contributory negligence should bulk largely in the debate; and stress was laid upon the heavy liability that might be thrown on colliery owners in regard to an explosion caused by the carelessness of one man. This consideration, however, does not affect the gist of the question, which is whether or not a workman should be indemnified for the personal injuries he may receive while following his lawful calling. The "doctors" differ, of course, as to the figure which would represent this compensation in the cost of coal. Mr. Bainbridge's 2d. per ton becomes about ¾d. per ton in the hands of the Home Secretary. Mr. Burt approved of the Bill; but he urged that when it becomes law there will need to be more co-operation between employers and workmen to prevent abuses. As to the suppression of carelessness and the prevention of accidents, Mr. Burt believes more in the preventative effect of thorough and complete investigations of such occurrences than in penal legislation. Here he is in accord with Mr. George Livesey, who has written to "The Times" to lay stress upon the desirability of bringing home to workmen a sense of responsibility in regard to accidents. In connection with the operation of the Bill on the coal industry, in which our readers are so deeply interested, it is hardly necessary to remark that English gas coal would not be in less demand at home or abroad by reason of its being 1d. per ton dearer for the sake of making provision for the hazards of coal mining. It is very difficult to believe, however, that the passing of the Bill in its present form would make any difference at all in the market price of coal of whatever description. Hypothetical considerations of what might happen to an industry by reason of the imposition of sanitary and other requirements not previously in general force, are common enough when schemes of legislative regulation are in the air. But such calculations have a way of dropping out of sight when the thing is done. In

the case of coal, the ordinary market oscillations from one month to another are greater than any estimate of the cost of insuring every man employed, on the Government scale; and though this argument may not be conclusive, it is incontestably weighty, and capable of being used with great effect.

We like the Bill for the care it proposes to take of the individual isolated sufferer from industrial accidents. It has often been remarked in these columns that what chemists call the "mass action" of public sympathy for the sufferers from accidents is very apt to operate to the loss of the individual. When a big colliery explosion results in a holocaust of victims, the purses of the public are freely opened, and the tide of benevolence rises high in proportion to the horror of the occurrence; but the isolated cases are liable to be passed over. Nor is it easy to see why the public should be required to come to the relief of coal miners more than of any other workers because of the peculiar nature of the risks they run, and of the manner in which these are distributed. One of the points that will have to be considered in Committee is how to deal with bankrupt firms and small masters. It is the general impression that the Bill is in great part due to Mr. Joseph Chamberlain, who made a most effective speech upon the second reading. He remarked that, according to his information, the cost of working the Bill will not be more than 1 per cent. upon the wages paid; and he had little difficulty in showing that this charge must eventually fall upon the cost of the commodity produced. Mr. Chamberlain also claimed that the Bill is not, like Mr. Asquith's Bill, a measure for the punishment of employers, but is for the benefit of the injured men. It is true that the relief must be obtained in the first place through the employer, just as wages are paid; but the liability is really borne in the end by the industry. Taking the Bill altogether, we have no hesitation in describing it as one of the grandest and most beneficent schemes of social legislation that has ever been submitted to the Imperial Parliament; and the manner in which it has been received by this august assembly is, on the whole, as creditable to it as anything in its history.

The New Scottish Provisional Order System.

In the House of Lords on Wednesday last, the Provisional Order (Scotland) Bill was read a second time after a brief but sufficient discussion. Lord Tweedmouth complained that the Bill "merely nibbled one corner of the subject;" and he asserted that it does not go far enough in simplifying and reducing the cost of preliminary inquiries. He declared that the Secretary for Scotland had fallen too much under the influence of the big railway peers, who naturally hate local authorities. There is a good deal in another observation by Lord Tweedmouth, that the legal element ought to be kept out of these Commissions altogether. He thought that they should be composed of men of affairs, and that the nearer the local Committees could be brought to the present constitution of Committees of Parliament the better. On the whole, he thought the Bill was not good enough for Scotland; and he begged the Secretary to keep it over for another year. It is wonderful how anxious the members of Her Majesty's Opposition are that the Government measures should be held over the session for better examination during the recess—when there would be so many capital opportunities, at public meetings, for twitting the Administration with their inactivity. The Earl of Morley, the Chairman of Committees of the House of Lords, took occasion to correct Lord Tweedmouth in regard to various particulars of the proposed reform, which he characterized as being a more important matter than appears upon the surface. The normal system contemplated by the measure is that Scotch Orders should be dealt with simply and solely by the Secretary for Scotland and the Chairmen of the two Houses of Parliament. In two cases only would such Orders come before Parliament: The Secretary for Scotland, after appeal by the promoters, might allow an Order to be introduced into Parliament as a Private Bill; and before an Order took its final form, it could be referred to Parliament, if an opponent memorialized the Secretary for Scotland to this effect. In the latter case, the Order would go before a Joint Committee of the two Houses, who would have ample power of giving costs; and this power may reasonably be expected to act as a great deterrent to petitioners.

Lord Morley proceeded to describe the existing practice in regard to unopposed Bills. At present he reads them all before the session begins; striking out anything that is contrary to the public interest or to the practice of Parliament. This is one of the little bits of autocratic power that still flourish under the shelter of the British Constitution. The new Bill proposes to create another, and to place it in the hands of the Secretary for Scotland. Lord Morley thinks that at least the Secretary should report to Parliament all the proceedings taken by him under the new procedure. While strongly in favour of local inquiries as a means of getting at the truth, his Lordship shrewdly remarked that he did not think it would prove very much cheaper than the present procedure. The chief point made by the Chairman of Committees was that it is unwise to make such a large transfer of power from the legislative to the executive branch of the Administration. The Earl of Camperdown agreed with this view, and also strongly protested against "lawyers or professional persons of that "sort" being put upon the proposed local tribunals. Lord Balfour, in reply, admitted that if the Bill passes, the system of legislating by Provisional Order will become the rule in Scotland, and the existing system the exception. He confessed that the *crux* of all questions of reform in this direction is how to have local inquiries and at the same time preserve the effective supremacy of Parliament. Lord Herschell suggested that the difficulty might be overcome by adopting the expedient of giving parties a conditional right of appeal. The question is perhaps of comparatively small importance in regard to Scotch business, because of the strong sense of law and justice possessed by the people of Scotland. The importance of the point resides rather in the consideration that if delegated Private Bill legislation is found to work satisfactorily, an agitation will certainly be raised in favour of extending the benefit to Ireland next, and eventually to England.

The Cause of the Boston Street Gas Explosion.

In another column will be found a full abstract of the voluminous report of Judge Ely, of the Municipal Court, on the recent serious gas explosion in a street of the city of Boston, Massachusetts, which, as recorded in our columns at the time, resulted in the death of six persons and injuries to about forty others. This report puts responsibility for the disaster upon the Boston Gas Company. It describes the circumstances of the affair, beginning with the underground railway excavations, which uncovered a number of gas and other mains. A large void space was made in the roadway, over which the traffic was carried by temporary timber surfacing. The pipes in this empty space were supported by temporary props. After the explosion, the men who explored this region found an 8-inch main of the Boston Gas Company broken all round, and a 6-inch pipe of theirs was also discovered fractured in three places. This was where the gas came from. The breaks were all directly under different rails of the street tramways overhead. Both mains were old, having been in the ground thirty-five to forty years. They were bad pipes, having been cast horizontally; and where the 6-inch main broke first the metal was only $\frac{1}{8}$-inch thick. There was also a sand or air hole near the spot. Still, if the pipes had been allowed to remain in their old place in the solid ground, they would probably have continued sound to this day. There appears to have been some contention as to who should pay the cost of relaying or other work that it might be found necessary to do to the street mains in connection with the subway construction. The Boston Gas Company could not come to terms with the Boston Transit Commission upon this question; and Judge Ely finds that the Company did not take any precautions to see that their pipes were in a proper condition, had adequate support, or, in fact, took any care of them whatever. Neither did the Transit Commission, nor the Subway Construction Company. Indeed, a story of more reckless carelessness on all hands than is revealed in Judge Ely's report it has never been our duty to read. All the parties to the business were culpable; but seeing that it was the Boston Company's mains which were primarily instrumental in causing the disaster, and that the owners of this property are rightly responsible for its condition, Judge Ely finds that the Company are chargeable with the consequences.

A Grave Miscarriage of Justice.

It is occasionally remarked that in this and other countries "there is one law for the rich and another for the poor,"

and this would appear to be true in respect of prosperous Trade Unions and struggling employers, to judge from an incident that came under public notice last week. In the issue of the "JOURNAL" for Jan. 19 last, we chronicled in this column the result of the action of *Bailey and Another v. Pye and Others*, which gave the plaintiffs, a firm of glass merchants, £674 damages and costs against the defendants, officials of the Glass Bevellers' Trade Union. The case was like many others that have from time to time exhibited the combination of offensive power with legal irresponsibility which constitutes the most valuable prerogative of the Trade Union. The named defendant, Pye, was the moving spirit of a desperate strike against the Messrs. Bailey. In his capacity as chief officer of the Glass Bevellers' Union, he organized this little industrial war, provided pickets, bought off workmen and apprentices, and finally contested a case through three-and-a-half days' hearing, with Mr. Asquith, Q.C., as the leading Counsel for the Trade Union. In the end, when Counsel could not contest the case any longer, defendants consented to a verdict for the damages named, and submitted to a perpetual injunction. We predicted at the time that with this termination of the case the whole responsibility of the defendants would disappear, and that the Glass Bevellers' Trade Union would cease to demand "recog-" nition" by the employers or anybody else. This expectation has been verified to the letter. On the 18th inst., Messrs. Bailey communicated to the Press the intelligence that the taxed costs in this action amounted to £543; making with the damages £1217 in all. When application was made for this money, the reply was returned that the firm might get it the best way they could; and as the result of executions against the principal defendants, the sum of £5 was recovered out of the £1217 due. Naturally, the firm complain of the injustice of being prevented from recovering the fruits of their judgment from the funds of the Trade Union or those of the 99 other Trade Unions which had financially assisted in persecuting and inflicting this injury upon them. The total loss of the firm in resisting this tyranny, with seven months' picketing, has been upwards of £2000. The inequality of the law is that if the Trade Union had been successful, the whole strength of the Executive would have been directed to secure payment of whatever sum the Court might have found to be due to the defendants. There is nothing novel in this anomalous position. As the law stands, though the legal fiction that the Crown can do no wrong has been subjected to modification by way of "disclaimer," so to speak, until the subject can usually obtain redress even against the monarch, this position of immunity has been freely granted to Trade Unions. It is not a pleasant idea; but the difficulty of bringing the "many-headed" to book, whether as a Trade Union or an illicit club, is enormous, and defies reduction within the scope of a remedial Bill. Such instances as this of the Glass Bevellers' evasion deserve to be held in remembrance whenever claims are raised by agitators for the "recognition" of this or that Union as competent to treat with employers on behalf of workmen. One of the most deplorable consequences likely to follow from the miscarriage of justice in this case is that, in the event of future organized strikes, employers will be tempted to rely upon themselves for protection, and be as lawless as the strikers.

WATER AND SANITARY AFFAIRS.

WHILE the County Council are talking of bringing a supply of water from Mid-Wales, and are contemplating a costly parliamentary effort for the purpose, London has the satisfaction of knowing—if it cares to know—that the Metropolitan Water Companies are providing a splendid supply from sources nearer home. At the half-yearly meeting of the West Middlesex Company last week the Chairman, Mr. Edmund Boulnois, M.P., congratulated the proprietors on the completion of the new works at Barnes Elms, by which they were put in possession of four of the finest reservoirs in the world. Practical proof was thus afforded that, in the event of any drought or accident interfering with the supply, there was a splendid reserve as a guarantee against any scarcity of water in their district. In face of this statement from the Chairman, it may be asked: Why should the West Middlesex Company enter into the triple alliance for the formation of the Staines reservoirs? This, however, is a scheme which looks far ahead; and in the latter part of his speech Mr. Boulnois remarked that when the Staines works were carried out, the reserve of water at the command of the three Companies concerned would be such that they might sit perfectly calm and comfortable "for a great many years to come." If the Companies are happy as to the supply, the consumers may be the same; and the ratepayer has the advantage of seeing the work carried on without any hand being dipped into his pocket. Already he is paying handsomely for the efforts of the County Council to prevent the extension of the London water-works and to introduce the Welsh scheme. We lately mentioned that the estimates of the Council for the year ending in March, 1898, include a probable outlay of £7500 on the Water Question. A fuller version of the estimates than was then available informs us that, in the event of the Council deciding to proceed with a Bill in Parliament in the session of 1898, to authorize a new water supply from Wales, a further provision of £6000 may be required. While this kind of system goes on, it is no wonder Mr. Boulnois finds reason to complain that the rates of the Metropolis appear to be "everlastingly" on the increase. Of course, the Council boast of making a reduction of three-farthings in the pound on the county rate for the coming year. But the truth is that they are going to spend very nearly £20,000 more than in the past year, only they have managed to hold some large balances in reserve, and have got a lift of £45,000 from the tramways. They also gain nearly £16,000 from the increase in the assessable value of the Metropolis compared with the rateable value of last year. The burden of taxation borne by the Water Companies is large; and the complexity of local finance in London has become such that perhaps nobody but the Comptroller and Mr. Gomme understand it. The Companies now have to look forward to the investigation which has to be carried out by the Royal Commission. From this they have nothing to fear, except the expense; the County Council taking £2500 for their share in the proceedings, while the Water Companies have to pay their own costs, besides contributing to the revenue of the Council. Among the questions coming before the Royal Commission is that of severing the areas. As Mr. Boulnois remarked, this is a very serious matter, involving the interests of the ratepayers on either side of the boundary. We might almost venture to say that this is the governing point in the whole inquiry. The Companies will assist the Commission with the fullest information they can furnish on the subject; and the County Council will expend the money of the ratepayers in trying to prove that London, for the purposes of the water supply, ought to be restricted to the limits of the Administrative County. We need hardly say that such a conclusion would be disastrous to the future of the London Water Supply; and we cannot conceive that the Royal Commission will ever adopt any such view.

The long and interesting paper on "The London Water "Supply" read by Dr. Percy Frankland at the Society of Arts last Wednesday, which we hope to notice at greater length in a subsequent issue, may be justly regarded as the author's second public protest within a few months against the attacks which have lately been made upon the quality of the water sent out for consumption within the Metropolis. In November last year, Dr. Percy Frankland dealt with this subject in a paper read before the Institution of Civil Engineers; and it may be said of that communication, as of the one presented to the Society of Arts, that its object was to emphasize the advantages of subsidence and sand filtration in the preparation of river water for the use of mankind. There was but a small audience last Wednesday, owing possibly to the coincidence of the meeting with the first *conversazione* of the Royal Society; and the discussion was confined to three speakers, only one of whom (Dr. Dupré) in reality criticized the paper. Dr. Frankland was charged with presenting misleading figures in taking averages instead of maxima. But, after all, there cannot be very much the matter with London water from which 99 per cent. of the bacteria originally in it have been removed by filtration; and as for the presence of "suspended matter," so long as the quantity contained in each gallon of water is expressed by figures in the third and fourth places of decimals of a grain, it cannot, we think, be very harmful. According to the last report presented to the Official Water Examiner by

Mr. Crookes and Professor Dewar, Thames water which contained 3277 microbes per cubic centimetre before filtration had only 38 afterwards; while in that drawn from the New River and the Lea, which in its raw state contained respectively 892 and 708 microbes per cubic centimetre, only 13 and 27 were found when it was in the filter-wells. The practical value of these bacteriological examinations of water, as it seems to us, is that they show to the water-works engineer the necessity for having ample storage and filtration plant. With this to help him, he will not have much reason to fear the microscope or the micro-filter.

Oil Lighting by Constant Supply.—Mr. W. Reynolds, the Managing-Director of the Imperial Oil Lighting Company, and the inventor of the method of lighting by paraffin oil known as the Reynolds-Astley system, recently gave demonstrations of his invention before the members of the Royal Institution. This system of constant supply was practically illustrated by a small installation with an illuminating power of about 500 candles.

Apparatus for the Estimation of Free Nitrogen in Purified Coal Gas.—In the "Bulletin de la Société Chimique de Paris," M. Arth describes this apparatus. He has arranged it in such a way as to enable him to collect and measure large quantities of nitrogen gas, thereby considerably reducing the effect of errors of observation. The apparatus is a kind of combination of Crum's nitrometer with Frankland's gas-measuring apparatus.

Association of Gas and Water Engineers of Austria-Hungary.—The sixteenth annual general meeting of the Association will be held at Linz on the 28th and 29th inst. Among the communications to be presented to the meeting are one by Professor Alto-Arche, of Vienna, on "The Heating Value of Gas-Stoves of Various Systems," and one by Herr F. Lux, of Ludwigshafen, on "The Pfudl Gas-Meter for Day and Night Consumption."

The Water Consumers' Protection Bill.—In the House of Commons yesterday afternoon, the Bill promised by Mr. Chaplin, having for its object the protection of London water consumers, was presented and read the first time. The right honourable gentleman described it as a short, simple, and modest measure to deal with the present situation, pending the report of the Royal Commission. It left the water consumers all the rights and remedies that they now possess at law, but created on additional tribunal—the Railway Commission—before which complaints could be made, and empowered the local authorities to assist them. The second reading is put down for next Monday.

A Petroleum Welsbach Lamp.—A new petroleum Welsbach lamp, known as the "Washington," was exhibited and described by Mr. C. K. Munns at the meeting of the New York Section of the Society of Chemical Industry on the 23rd ult. The oil is forced by air pressure from a reservoir through a capillary to a vaporizing chamber, which is heated by the flames of two burners between which it is placed. Two strokes of a small hand pump give the necessary pressure of air for a day's consumption. The vaporized petroleum mixes with air and passes to the burners already mentioned, which are provided with Welsbach mantles. It was stated that each of the two burners had an illuminating power of 500 candles, and that the consumption of oil amounted to only 0·05 gallon per hour. The heat of the flame is said to be sufficiently great to melt platinum.

The Rawson Patent for Stiffening Incandescent Gas Mantles.—Our readers may remember the statement made that the litigation in respect of incandescent gas mantles which occupied so long a time in the Courts last year did not complete all the actions needing adjudication. One of the most important of the later actions commenced was that by the Sunlight Incandescent Gas-Lamp Company, Limited, against the Incandescent Gas-Light Company, Limited, for infringement of the Rawson patent for the toughening of mantles so as to render them more fit for transport. This action has been for weeks anticipated as ready for trial; and it was originally set down for hearing in the Chancery Division of the High Court of Justice as yesterday. Within the last few days, however, it has transpired that the defendants in the action have applied for leave to amend their pleadings in consequence, it is said, of the discovery by them that the Rawson patent was allowed to lapse last September, owing to the non-payment of the necessary fees. Of course, this discovery does not put an end to the litigation in question, but would appear to limit the claim by the Sunlight Company to damages for infringement up to the date mentioned. In connection with this matter, it may be stated that in December last (three months after the patent had lapsed) the Solicitors of the Sunlight Company issued a circular, addressed to the "trade," pointing out that the sale of Welsbach mantles exposed them to actions for infringement in the event of their clients succeeding in the action they had already commenced; also that purchasers would render themselves liable to pay damages and costs, and in addition have their stock of Welsbach mantles destroyed by order of the Court. They further went on to say that the only persons entitled to deal in this country in mantles stiffened and strengthened under the Rawson patent, in addition to their clients, were the New Incandescent (Sunlight Patent) Gas Lighting Company, Limited. This matter, in its preliminary stages, has already occupied the Courts.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 1203.)

THE Stock Markets had a good time last week; but not altogether as good as at one time it promised to be. After a quiet opening, coupled with considerable firmness, the markets took a start, and became very active and buoyant. It really seemed as if the long looked for advent of buyers had come at last. But it did not hold on long; and a move to realize on advanced prices gave a smart check to the upward course, and imparted a rather flat tendency. Henceforth the condition of the markets fell quiet, and somewhat irregular. Still, the closing prices showed a marked improvement on the opening figures. The Money Market continues in a condition of extreme ease, and rates are as low as they well can be. Business in the Gas Market was only moderately active. But the tendency was firm and good; and several quotations have advanced, while none have receded. The demand for good investment stocks caused by the plethora of money had an appreciable effect. In Gaslights, the "A" showed no very marked feature; being moderately dealt in throughout the week at about the same prices, but without any disposition to advance. The "H" limited was pretty active; and the prices of the 10 per cent. preferences and the debentures rose. South Metropolitan was very quiet and unchanged. Commercials were busier—a little stock coming into the market, and being readily taken up at advancing figures, and quotations rose accordingly. Letters of allotment of the £71,500 further capital authorized at the recent general meeting—half in new stock and half in 4½ per cent. debenture stock—were issued to the proprietors on the 20th inst. The Suburban and Provincial division were dead quiet, with hardly a deal in them; and quotations did not move. Among the Continentals, Imperial was rather animated in the earlier part of the week, and changed hands at good steady figures; but later on it fell quite calm. European and Union were unchanged. Several of the rest improved on their opening prices. Belgrano had a further rise, in view of the increase in the dividend; and San Paulo and Chicago also advanced. Water stocks were a little more active, and with a much better tendency; several quotations showing a fair gain.

The daily operations were: Gas was very quiet on the opening day; but some Gaslight issues moved up. The "C," "D," and "E" 10 per cents. and the 4 per cent. and the 4½ per cent. debentures rose 2 each. In Water, Kent and New River were 2 higher. Business in Gas was much more active on Tuesday; but the only change in value was a rise of ¼ in Belgrano. Moderate business in Gas at strong prices was the feature of Wednesday. Gaslight "J" advanced 2. In Water, Lambeth tens rose 1; and Grand Junction, 2. Thursday became very quiet; but some good advances were effected. Commercial new moved up 3; Chicago, 3; and San Paulo, ½. Transactions were more brisk on Friday; and prices were good. Commercial old rose 2; and ditto new, 5. In Water, Grand Junction and Lambeth improved 1 each. Saturday was quiet and featureless. Lambeth Water gained 1 more.

ELECTRIC LIGHTING MEMORANDA.

The Electric Lighting Finance of the St. Pancras Vestry—An Explanation—The Economy of the Combination of Electricity Generation and Dust Destruction—Good Results at Tunbridge Wells.

THE information we were able to publish last week concerning the financial results of the last year's working of the St. Pancras electricity supply undertaking may be commended to the study of those who are inclined to think that there is some magical spell upon municipal ventures of the kind which ensures a degree of success that no mere company could achieve under similar conditions. It is unnecessary to repeat these statements here; but attention may be drawn to one or two aspects of the St. Pancras undertaking that were only hinted at in last week's "Electric Lighting Notes." The apparent hostility of the London County Council to the Electric Lighting Committee of the Vestry is bitterly complained of by the latter, who go so far as to threaten, not for the first time, to try to obtain deliverance from the financial control of the Council by going to Parliament direct. In order to improve the apparent prospects of such a revolt, the Committee bring in the names of other Metropolitan Vestries as being like themselves in intolerable bondage to this tyrannical central authority. It does not appear, however, either from the report of the Committee or the discussion held upon it by the Vestry, that the local authority properly appreciate their own position or that of the County Council in this regard. It seems to be assumed by the Vestry that the Council take a perverse pleasure in plaguing them in respect to their electric lighting finance. It is either overlooked or wilfully ignored that in this matter the Council are little more than agents for the Treasury; and that it is the latter, in the last resort, which is suspicious of the soundness of these electric lighting vestries' finance. The fact that the Vestry shut their eyes to the suggestion of there being any element of unsoundness in their financial methods does not dispose of the question, as

they would quickly discover upon applying to Parliament. The Treasury and the London County Council could never consent to the creation of separate Metropolitan Vestry stocks. It is not to be lost sight of, moreover, that, according to the showing of the St. Pancras Vestry themselves, it is only those Vestries that are involved in electric lighting that desire to be at liberty to go upon the investment market upon their own account.

It never occurs to these would-be rebels against the Treasury and the County Council that the very fact of their having incurred extensive responsibilities in respect of electric lighting would militate against their chances of successful independent borrowing. Yet indications pointing to such an eventuality are not wanting. Only last week, the Corporation of Exeter failed to float a stock issue of about £200,000. This failure may possibly have been due to a variety of causes; but the circumstance of the Corporation being in the possession of an unprofitable electric lighting undertaking probably did not improve their credit. It would be to far better purpose than anything they can accomplish by girding at the higher financial authority if the St. Pancras Vestry would seriously set themselves to ascertain why it is that this authority looks so askance at their repeated applications for more money for electric lighting purposes. It cannot surely be pretended that the London County Council entertain any objection to the principle of local authorities doing their own electric lighting, or going about to abolish the middleman in any way that may seem expedient to them. Failing objection to the principle, there must be something in the particular application to arouse hostility; and it is not necessary to look very far to discover what this something is. St. Pancras began with the notion of making a good profit out of electric lighting on a capital expenditure first of £60,000, then of £80,000. The amount actually borrowed is £153,000; and the account is not closed. This increase of indebtedness would mean nothing if it had been found necessary to provide for the expansion beyond the original plans of a profitable concern; but the case is otherwise. The St. Pancras Provisional Order is dated 1883; and for 1896 the Vestry accounts show a loss of £800, without touching the question of depreciation.

One may ask in vain when these particular accounts are likely to assume a healthier appearance. The sums required to be spent on repairs of mains and generating plant mount up steadily year by year, and it is an insult to common-sense to suggest that all this patched-up stuff is not depreciated in structural value and income-earning capacity. The Committee have considered the question of extending the service to Highgate, one of the best residential parts of the parish; and they recoil from the proposal because it does not look likely to pay. They had better occupy themselves with the more pressing problem of making the actual district of supply remunerative both in the present and for the future. Another matter that is smuggled through the accounts is the performance of the joint dust destructor and electricity generating works at the King's Road station. Where can precise information be found showing to what extent the promises made respecting the efficiency of this combination have been realized? The two generating stations are entered as having taken from, and supplied electricity to each other, which is quite natural; but whereas the Regent's Park station is credited with having earned a profit of £8785 for the year, the King's Road station is debited with a loss of £847. The most curious thing of all is that whereas the cost of fuel per unit generated in the case of the Regent's Park station works out to a little over 0·7d., the figure for the King's Road station, where the dust destructors are, is 1·3d., or very nearly double. A few more such economies as this would rouse even the patient St. Pancras ratepayer, if he were able to disinter the evidence of them from the decent obscurity of the form of accounts.

As though to prove once more the truth of the contention that there is no royal rule for determining, upon general principles, whether electric lighting is or is not a paying business, but that every example must be treated on its merits, the accounts relating to the Tunbridge Wells Corporation electricity supply undertaking are just now available for comparison with the St. Pancras figures. This little concern has been in operation only eighteen months, yet it has to its credit an available surplus of profit of £1628 up to the year ending last March, after providing for interest and the repayment of capital. The total capital expenditure has been under £24,000, by which a revenue of £4148 was earned from the sale of current. No fewer than 14,000 lamps are actually connected, which is a truly exceptional meed of success. Another thing proved once more by these accounts is that the cost of coal for generating the unit has nothing, or next to nothing, to do with the economical result of the working. At Tunbridge Wells, as might be supposed, coal is about as dear as it is anywhere within the three kingdoms. The cost of fuel for generating electricity here works out to 1·38d. per unit, which is very little more than the corresponding figure for the grand combination plant of the St. Pancras Vestry. Yet the sale of electricity for lighting in Tunbridge Wells is, on the face of it, a paying business. The secret is to be found, of course, in the nature of the district. In these matters, the character of the district is everything, the cost of raw material nothing. Tunbridge Wells is in part a compact, prosperous old town, and in part a rapidly-growing residential suburb of London. The local Gas Company are hard put to it to make accommodation for the ever-increasing demands that come upon them from this rapid increase of the population; and they, at least, must be unfeignedly glad that they have now some little assistance in the performance of the task of lighting the district. We believe that the increase of gas consumption in Tunbridge Wells just now is something like 15 per cent. per annum; and as the town is able to support a profitable little electric lighting undertaking as well, the inhabitants must be fond of living in plenty of light.

THE INCORPORATED GAS INSTITUTE.

Programme of the Forthcoming Annual Meeting at Bath.

We have received the official programme of the thirty-fourth annual general meeting of the Incorporated Gas Institute, which, as already notified in the "Journal," is to be held in the Guildhall, Bath, from the 15th to the 17th prox., under the presidency of Mr. C. Stafford Ellery, the Engineer and Manager of the Bath Gas Company.

On the opening day, the members will receive a welcome from his Worship the Mayor of Bath (G. Woodiwiss, Esq., J.P.); and the usual business will then be proceeded with. This will include the presentation of the report and accounts, and also of the Birmingham Medal, which has been unanimously awarded by the Council to Dr. Auer von Welsbach. The report opens with a statement of the membership of the Institute at the close of the past year, as follows: Honorary members, 20; ordinary members, 474; extraordinary members, 34; associate members, 48; associates, 58—total, 634. As indicating the increasing strength of the Institute, the Council notice with gratification that the new ballot-list contains no less than 52 names. The election at the last annual general meeting resulted in the total addition of 28 names to the register; and there have been 15 resignations and removals of names, in addition to the loss by death of the following eight members: Mr. R. W. Brett, of London; Mr. David Clarke, of Ashton-under-Lyne; Mr. J. M'Crae, of Dundee; Mr. J. Mackenzie, of Wilmslow; Mr. J. L. Mitton, of Longwood; Mr. P. J. Salmon, of Galway; Mr. T. Travers, of Cork; and M. Le Treust, of Amiens. The last-named gentleman was an honorary member, having been elected on his appointment as President of the Société Technique de l'Industrie du Gaz en France. Mr. Travers will, they say, be remembered for many valuable contributions to the "Transactions" of the Institute, both as an author and in the discussions. Referring to the proceedings at the highly successful meeting held in London last year, the Council report that premiums have been awarded to Mr. A. Dougall, of Tunbridge Wells, for his paper on "The Popularization of Gas;" to Mr. J. Holliday, of Scarborough, who read a communication on "Gas-Engines as Economical Motors;" and to Mr. F. G. Dexter, of Winchester, who dealt with the subject of "Incandescent Public Lighting." The whole of the papers (ten in number) which were brought under the consideration of the members, with the discussions thereon, appear in the published "Transactions," in which several improvements have been carried out on the recommendation of the Publications Committee. The Council, recognizing the importance of obtaining, in the discussions, as complete a record as possible of the views and experience of the members, have arranged that in future those who are prevented from speaking at the meeting shall be invited to send their remarks in writing to the Secretary, for insertion in the "Transactions." The vacancies caused on the Council by the election of Mr. S. Stewart as Vice-President, and by the resignation of Mr. T. Duxbury, have been filled by the appointment of Mr. John Laycock, of Keighley, and Mr. Lewis T. Wright, of London. Reference is made to the satisfactory condition of the finances, as shown by the audited accounts appended to the report; the balance standing to the credit of the Institute at the close of the past year being £1008—the profit on the year's work having been £72 14s.

The rest of the first day will be devoted to the delivery of the Inaugural Address by the President, and the reading and discussion of papers, a list of which is given below. At the close of the business, the annual meeting of donors and subscribers to the Benevolent Fund will be held. The subscriptions to this fund last year amounted to £70 17s. 6d.—being £11 11s. more than in 1895; and donations to the amount of £63 11s. 6d. were received, or £53 1s. 6d. above those for the preceding twelve months. These increased amounts resulted from the special appeal made last year, the object of which was to bring the capital of the fund up to £2000, and to raise the annual subscriptions, so that the Committee of Management might have at their disposal a sum of not less than £200 a year. Though this has not been achieved, the Committee are thankful for what has been done; and they express the hope that the deficiency may be made up "in the present year of jubilee, when so many generous hearts are opening in response to the calls for help on behalf of the necessitous."

The second day will be devoted to a lecture by Professor Vivian B. Lewes, F.I.C., F.C.S., on "The Theory of the Atmospheric Burner and its Influence upon Incandescent Gas Lighting," and to the reading and discussion of papers; those remaining being taken the next day with the remainder of the general business.

The following are the titles of the papers to be submitted: "Experiments with the Claus System of Purification at Belfast." By James Stelfox, of Belfast. "The Automatic Regulation of Pressure in the Distribution Mains." By W. R. Chester, of Nottingham. "Naphthalene Difficulties: Their Causes and Remedies." By William Young, of Peebles, and Thomas Glover, of West Bromwich. "The Taxation of Gas by Local Authorities." By Isaac Carr, of Widnes. "Is the Municipalization of Gas Undertakings Advantageous?" By Herbert Lees, of Hexham. "Cooking by the Aid of Gas, and the Ventilation of Kitchens." By William Sugg, of London. "Experience in the Working of a Gadd and Mason Spiral-Guided Holder." By Robert Hunter, of Chester. "Gas Distribution in Relation to Modern Municipal Development." By Thomas Canning, of Newport. "Three Years' Use of Carburine as an Enricher." By Joseph Davis, of Gravesend.

The business will be relieved by the usual social functions. On the evening of the first day, there will be a smoking concert in the Guildhall; and the next evening, the members and their ladies will be invited to a reception by the Mayor. Any members desirous of inspecting the Bath Stone Quarries at Box, or Messrs. Stothert and Pitts' Engineering Works, will be invited to do so on the afternoon of the 16th. The Roman Baths and the Bath Gas-Works will be open to the members. An exceedingly well got-up guide-book to Bath has been sent out by the Council. Friday, the 18th, will, as customary, be devoted to an excursion; the place selected being Longleat Park. On the way there, Hinton Abbey, founded in 1232, Norton St. Philip, Wolverton, and Frome will be passed. The party will drive through the Deer Park at Longleat to an elevated spot called "Heaven's Gate," from which a fine view of the charming surrounding country is obtainable. After luncheon, which will be served in a marquee at Shirewater, in the park, Longleat House may be visited, by permission of the Marquis of Bath; and those members who are fond of boating will have an opportunity of indulging in this pastime upon the lake. After tea, the return will be made by a different road, and facilities will be afforded to members desirous of getting home promptly by rail from Warminster.

THE AUTOMATIC IGNITION OF GAS.

Devices of various kinds for automatically lighting gas-burners have been introduced from time to time; and in a recent number of the "Journal für Gasbeleuchtung," the Chemist of the Berlin Gas-Works, Herr H. Drehschmidt, has described the more successful of them. He begins by pointing out that the facility with which an electric lamp is ignited and extinguished has been one of the most prominent advantages of electricity over gas for lighting purposes; and he says the stress of competition has compelled attention to appliances for placing gas on an equality with electricity in this respect. It is probable that electricity will eventually come to the aid of gas; but the electrical devices for igniting gas automatically have so far been either large and ugly, or else complicated, and therefore unreliable. Other appliances are at present simpler and cheaper.

In the apparatus devised by Duke, he took advantage of the well-known property possessed by platinum sponge, of glowing in a current of hydrogen and air. Coal gas contains as great a volume of other constituents as of hydrogen; but these do not excite the sponge. In a mixture of hydrogen and air, the sponge glows with sufficient intensity to ignite the gas; but it does not ignite a mixture of coal gas and air. Rosenfeld showed, however, that coal gas and air caused the sponge to glow to a certain extent, and that a platinum wire attached to the sponge could be thus warmed. It was then raised to incandescence by the gaseous mixture, which it ignited. Rosenfeld's discovery was comparatively useless, because the sponge was found to become dense and inactive by repeated use. Duke, however, made a preparation of platinum to which this objection did not apply. He saturated meerschaum or similar porous material with a solution of platinum chloride, and dried it in a stream of hydrogen or coal gas at a temperature not exceeding 212° Fahr. The platinum was thus reduced and deposited in a very finely-divided condition on the material. It may be parenthetically remarked that platinized pumice, similarly prepared by the reduction of platinum perchloride, is well known in this country by users of Harcourt's method of estimating sulphur in gas. Porous material thus coated with platinum, used in conjunction with a projecting thin platinum wire, made a very durable and efficient appliance for automatically igniting a flat-flame burner as soon as the gas-tap was turned on. A little care was needed in attaching the appliance to the burner in such a position that it was exposed to the mixture of gas and air; and subsequently careful handling was necessary to prevent derangement. But with moderate attention, this appliance remained operative for a long period. Ammonia and sulphuretted hydrogen and vapours of carbon disulphide temporarily destroyed its activity.

The appliance was not so readily adapted to incandescent gas-burners; and the first attempts to utilize it were unsuccessful. If it was suspended from the rim of the chimney, or attached to the top of the mantle-fork so that it was immediately above the mantle, it was subjected to the action of the hot gases from the flame, and was injured thereby. If placed above a pilot-jet at the side of the mantle, some means of extinguishing the jet as soon as the burner was lighted was needed; and a tap which provided for this required in practice such careful manipulation that its general employment was out of the question. It was essential to success that a simple turn of a tap should complete the operation; and the patent taken out by the Greek Canellopoulos, which has been acquired by a Company in Berlin, first described a means of accomplishing this result. According to the specification, an abstract of which recently appeared in the "Journal," the flame of the burner heats a solid, liquid, or gaseous body in such a manner that the supply to the pilot-jet is thereby automatically cut off so long as the burner itself is in use. One method of achieving the object of the inventor was to take advantage of the expansion of a confined volume of air in a tubular chamber set up near the mantle. The lower end of the tube was sealed by mercury, and the expansion of the confined air by the heat of the burner-flame forced the mercury up the small gas-pipe which fed the pilot-jet, and thus cut off the flow to the latter. The supply to both burner and jet was controlled by one tap; and therefore on opening the latter the gas flowed to both simultaneously. The pilot-jet was ignited by means of Duke's device, as described for flat-flame burners; but before the flame could be communicated to the burner, a considerable quantity of gas had flowed out, and formed an explosive mixture within the chimney. The ignition of this mixture by the pilot-jet injured the mantle.

It was therefore necessary that the gas should only begin to flow to the burner after the pilot-jet was already ignited by means of Duke's appliance. The firm of Ludwig Loewe and Co. made an improved apparatus, also depending on the principle of expansion as set out in the patent of Canellopoulos. They, however, used a platinum wire in place of confined air as the expanding body. The platinum wire was suspended from a hook alongside the mantle, and adjacent to the flame of the pilot-jet. Its lower end supported one end of a lever, the other end of which was attached to the plug of a two-way valve on the gas-pipe. When the wire was cold and taut, the plug was held so that it closed the way to the burner, and left open that to the pilot-jet. If then the gas-tap was opened, the gas only flowed to the pilot-jet, and was there ignited by Duke's device. Then the heat of the flame of the jet slightly expanded the platinum wire, and thus the way to the burner was slightly opened. The gas which then flowed from the burner ignited from the flash-light, and the heat of the burner-flame further expanded the wire. The way to the burner was thus opened to its full bore; while that to the jet was completely closed, and the light extinguished. This appliance, of course, depends for primary ignition on the proper action of the platinized meerschaum and the platinum wire as used by Duke; and it therefore fails with oil gas or other gas that contains little free hydrogen. After the extinction of the burner, a short time must elapse before re-ignition is attempted, as it is essential that the platinum wire which operates the valve should be cold when the gas is first turned on. On account of the slow flow from the pilot-jet, the distance from the tap to the burner or burners supplied should not be more than about 25 feet. If it is more, the interval of time between turning on the tap and ignition is very great. One tap may control several burners provided each is fitted with the device for automatic ignition.

AN AMERICAN VIEW OF ACETYLENE.

A considerable section of the chemical and engineering public of America appears to be at least as keenly interested in the acetylene question as is the same order of British technicians. The most striking quality of modern applied science, as compared with that of the past generation, is the celerity with which it fastens upon any new fruits of scientific research that the laboratories of the world may yield from time to time. No sooner is a novel discovery in the realms of physics or chemistry announced, than a cosmopolitan host of specialists of every conceivable shade pounce upon it, and try to ascertain what are the nature and scope of its practical potentialities. There is, in point of fact, a technical world ready made for every scientific novelty to fall into; and so quickly is the process of appropriation effected, that within a very few weeks or months all the characters and possibilities of the new comer are known in every part of the civilized world. It matters nothing that the discovery is wholly unexpected—as in the cases of argon, the Röntgen rays, and commercial acetylene. Its place in the scheme of technics is immediately allotted to it; and by the time the popular weekly journals have informed their readers of its existence, the technical world has forgotten that there ever was a period when it was not known. The three novelties we have named are very perfect illustrations of the character of modern pure and applied science. Argon was the fruit of research, pure and simple. The announcement of the discovery of a previously unsuspected constituent of the atmosphere fell like "a bolt from the blue" upon the scientific and technical worlds; and there was the greatest commotion respecting it for rather more than the proverbial nine days. After a while, however, it came to be generally known that argon was too exclusive and inert to enter into any of the regular work of civilized humanity; and so by degrees it was left alone. The next novelty

was of a different character. The Röntgen rays possessed a certain capacity for work; and accordingly they were put to work forthwith. Ever since Professor Röntgen's discovery made its bow to the world, it has been exploited for all it is worth by those who in every land have taken practical possession of it. Yet withal it has never abandoned its proper position as a scientific discovery, fit to occupy the disinterested study of those who have no commercial motive in devoting themselves to the task of learning all there is to be known concerning it. Acetylene belongs to a very different category. From the instant of its introduction to the world, it has been treated on all hands with mercantile intent. With very few exceptions, the swarm of patentees who have tried, and are still trying, to create some sort of proprietary right in connection with acetylene show no true scientific interest in the improved production of calcium carbide or the application of acetylene to any useful purpose. They have fastened upon its most obvious capabilities, and are endeavouring—for the most part vainly—to convert these to their own private advantage.

Meanwhile, the additions to contemporary knowledge of the possibilities of commercial acetylene are few and meagre. We continually publish the substance of papers and articles written about it in every civilized language; but after all the reliable stock of information respecting it remains attributable to Berthelot, Moissan, Willson, Lewes, and Clowes. Recently, Professor D. S. Jacobus, of the Stevens Institute of Technology, lectured upon "Artificial Light" before the Franklin Institute. The full text of the lecture is given in the current number of the "Journal" of the Institute; and we propose merely to give a cursory account of how the lecturer treated his subject. A good idea of the lecturer was to exhibit to his audience the effect of various colours when viewed by different lights. For this purpose, clusters of the different lights—presumably of approximately equal illuminating power—were placed on the platform about six feet apart, and behind screens so that they were not directly seen. Midway between these groups of lights the lecturer exhibited large pieces of tinted cardboard, folded at an angle so that there were two similar surfaces, each exposed to a source of light, while allowing the audience to observe both at the same time, and thus compare the effects. A second series of exhibits was of colours of slightly different tints, which appeared of nearly the same hue when held in one position between two sets of lights, and of widely different hues when the colours were reversed so as to be lighted by the opposite set of lamps. The lights employed were ordinary gas flat flames burning the highly carburetted water gas of the district, the same gas with Welsbach burners, acetylene, and incandescent electric lamps.

Many colours seemed of a different hue when viewed by the acetylene and Welsbach lights respectively. Some colours appeared brighter under the acetylene light than by the Welsbach; and this was especially so in the case of the lighter shades of pink. With some other colours, the reverse was found to hold. On placing the hand between the Welsbach and acetylene burners, the side illuminated by the former appeared yellowish, and that illuminated by the acetylene exhibited the natural pink tint. Ordinary gas and electric incandescent lamps showed the same difference from the Welsbach effect. The lecturer described experiments which he had made previous to the lecture, in the comparison of different colours under the various artificial lights and daylight. The acetylene flame was found to show the light pinks or flesh colours more nearly in their natural tints, or their colours when viewed by daylight, than the Welsbach. The same observation applies to the incandescent electric lamps and ordinary gas flat flames, as compared with the Welsbach. The experiments were held to demonstrate that there is a very slight difference in favour of the acetylene flame as compared with the incandescent electric light in bringing out delicate shades of pink; and that ordinary gas, burnt in flat-flame burners, comes next in this respect. On the other hand, some colours other than pink—violets and mauves?—were found to appear more nearly of their true tints under the Welsbach than under the other lights, in the experiments where the lights were compared directly with daylight.

Professor Jacobus gave a table showing the candle power developed by the different illuminants in the experiment. On the basis of a consumption of 5 cubic feet per hour, he found the illuminating powers to be: For flat flames, 20 candles; the Welsbach light, 70; and acetylene, 200. This also means that, for a light of 16-candle power, the gas consumption per hour in cubic feet of the different burners and material would be: Carburetted water gas flat-flame, 4; Welsbach, 1·14; and acetylene, 0·40. The accompanying generation of heat in British thermal units would be 2800, 798, and 568, as against 250 units for the incandescent electric lamp. Let us remark, parenthetically, that in the last figure we are supplied with a useful datum for measuring the calorific power of incandescent electric lamps, which is sometimes made much and at other times little of, according to the purpose to be served.

Having thus ascertained the place acetylene holds as an illuminant, Professor Jacobus proceeded to discuss it as an explosive, which it becomes when 3 per cent. of the gas is mixed with air. With coal gas, 8 per cent. is the minimum for preparing an explosive mixture. Moreover, the maximum amount of acetylene that can be mixed with air to form an explosive is 82 per cent.; the corresponding figure for hydrogen being 72 per cent. Hence, at both ends of the scale it appears easier to make an explosive mixture with acetylene and air than with either hydrogen or coal gas and air. Again, acetylene is so much more nearly of the density of the air than common coal gas that it would diffuse in air but slowly, thus facilitating the collection of an explosive mixture in a confined or ill-ventilated space. Professor Jacobus cited Berthelot upon the explosive properties of acetylene, whether gaseous or liquid; and he did not attempt to add anything to the familiar record. It appeared incidentally in this part of the lecture, that America has had some experience of the dangers of handling acetylene under pressure; although, marvellous to relate, the biggest thing on earth in the matter of acetylene explosions has not yet occurred in the United States. Still, this great country puts in a good claim to have witnessed the most remarkable acetylene accident yet registered. Only last January, in Jersey City, some liquefied acetylene was being blown from a tank into a felt bag, with a view to obtaining some solidified acetylene, or acetylene snow. Somehow the escaping gas exploded, and set fire to the accumulated mass of solid acetylene, which badly burnt one of the workmen. He must have been as much frightened as hurt, at this extraordinary behaviour of a snowball.

Professor Jacobus investigates the question of the cost, in New York, of the different kinds of light with which he has been experimenting. Incandescent electric lighting is supplied here at a charge of 1 c. per lamp-hour, 16-candle power. The local carburetted water gas, of 20-candle power, at $1·25 per 1000 cubic feet, costs just half this—or 0·5 c. per hour for a 16-candle flat-flame burner. The Welsbach light works out to 0·17 c. per 16-candle power per hour. If calcium carbide were supplied to the gas companies at $40 per ton, the equivalent cost of acetylene would be the same as that of carburetted water gas in the flat-flame burner of the first example—that is to say, 0·5 c. per 16-candle power per hour. It would need to be so supplied at $19·50 per ton, converted into gas, to compete on equal terms with the Welsbach light. To be as cheap as kerosene for domestic lighting (assuming the process of generation of the acetylene on the spot to be safe), calcium carbide would need to be retailed for $45 per ton in New York. Professor Jacobus perceives that the cost of gas to gas companies, taken in the holder, is very different from the price as delivered to consumers; and he admits that, where common coal or carburetted water gas can be put into the holder for 30 c. per 1000 cubic feet, the Company could not afford to pay more than $30 for carbide of calcium to produce acetylene of equivalent illuminating value. He does not think, all things being equal, that the capital required for a pure acetylene gas plant, supposing such a thing possible, would be less than, if it was so low as, that required for a coal-gas plant of equal lighting capacity. This is a material point, bearing in mind the possibility that any day may see a huge acetylene gas scheme put before the public, for the destruction of the gullible. This is the passage of the lecture bearing upon the point: "In a plant specially constructed for acetylene, the system of mains for the transmission of the gas would have to be laid with much more care than for ordinary illuminating gas, and special piping might have to be used; so that the capital investment of a specially constructed acetylene gas plant might be as much as or more than for one furnishing ordinary illuminating gas. If one-tenth as much acetylene were used for a given illumination as with the ordinary gas, then, if transmitted through the same system of pipes, the percentage of leakage, based on the amount of gas used by the consumers, would be increased about tenfold; or, if the percentage of leakage in a system had been 5 per cent. with ordinary gas, it would be about 50 per cent. with acetylene of the gas used by the consumers, or 33 per cent. of the gas stored in the holder." This is one way of discussing the question of unaccounted-for gas; but it may be doubted if it is a method that will command the respect of gas engineers. The Professor continues: "The system of piping now in place for ordinary illuminating gas would not, therefore, be suitable for the transmission of acetylene gas. If special pipes were laid for the acetylene gas, they would be required to carry a less volume of gas for a given illumination, and could be made smaller; but it is probable that the care required to produce tight joints would make it just as expensive to lay them as to lay pipes for ordinary illuminating gas." From which it appears that Professor Jacobus is not very well up in the best modern gas main-laying practice.

Professor Jacobus is more at home in demonstrating that it would not be economically feasible to make calcium carbide as a bye-product of central electric lighting stations. He concludes that, to compare with electric light in the matter of cost, the carbide to produce acetylene must be made at some point—say, a water-power—where the cost of the power and attendance is much less than at the central lighting station.

Yet he points, justifiably as we think, to the circumstance of a large business being actually done in incandescent electric lighting at twice the cost of gas in flat-flame burners, as showing that the public regard other elements besides price in dealing with artificial illuminants. In the same way, it is possible to argue that acetylene—producing as it does a more brilliant light than any now used for interior lighting, and having the quality of showing the complexion in life-like tints—will find a field of its own, even though it should be the most costly style of illumination. "Again, acetylene is now used in place of calcium light

for lantern projections, &c. Were it not for the explosive character of the compressed acetylene, it would be useful for cases of isolated lighting—such as for beacons and life-buoys." It would, we think, be extremely unfortunate if the impression were to get abroad that acetylene furnishes a safe light for lantern projections. It would be far better for it to be used in what Professor Jacobus calls isolated lights than as a substitute for the lime-light in crowded assemblies, and probably in inexpert hands. With this reservation, it is possible to pass the Professor's summing up "that each system of lighting has its own field of usefulness, on account of properties peculiar to itself, which make it more desirable than the others for certain classes of work." The question of the real utility of acetylene is a peculiarly tantalizing one.

PERSONAL.

We learn that Mr. S. Penny, Assoc.M.Inst.C.E., has voluntarily resigned his appointment as Engineer and Manager of the Uxbridge and Hillingdon Gas Company, in order that he may have greater freedom of action with regard to his private practice.

Probate of the will (dated Dec. 2, 1892) and one codicil thereto (dated Jan. 17, 1896) of Mr. F. W. Crossley, late of the Star Hall, Ancoats, has been granted to his widow, Mrs. Emily Crossley, his brother, Mr. W. J. Crossley, and his brothers-in-law, Messrs. R. J. Kerr and J. Thomson—the executrix and executors named in the will. The testator bequeaths the Star Hall and five dwelling-houses adjoining thereto, as well as all his plate, linen, &c., and articles of household or personal use or ornament, to his wife absolutely. He also bequeaths a legacy of £100,000 to his trustees, on behalf of his children. Subject to the above-mentioned legacy and certain legacies to relations and others, the whole of the residue is left to the trustees, upon trust for Mrs. Crossley absolutely. The gross personal estate has been sworn at £624,456 16s. 2d., exclusive of real estate and of property situated abroad.

OBITUARY.

Robert Mitchell.

Our readers will learn with feelings of the deepest regret that Mr. Robert Mitchell, who only seven weeks ago retired from the post of Engineer and Manager of the Edinburgh Corporation Gas-Works, died at his residence in Marchhall Road, Edinburgh, last Thursday. Mr. Mitchell was born in Lasswade, about six miles to the south of Edinburgh. He received his education in the parish school of Cockpen. He served an apprenticeship to the joiner trade; but seeking for something higher, he found his way to London, where an uncle of his was employed in the stores department at the East Greenwich Gas-Works. He obtained employment in the works; but after about a year, he returned to his native place. At this time Mr. W. Young, now of Peebles, was Chemist at the oil-works at Pentland, belonging to the Clippens Oil Company; and Mr. Mitchell being out of employment, Mr. Young gave him a situation as a sort of handy man about the oil-works. Part of his duties was to keep the laboratory. He took an interest in the work, and before long was discovered to have developed a remarkable faculty for chemical experiments. On account of this he was promoted, and went to the Company's other station at Clippens, where he took charge of the retorting department. By constant study, he qualified himself for something better, which came to him, after a few years, in his appointment as Manager of the Coatbridge Gas Company's works. He spent some years at Coatbridge; and then he was appointed Manager of the Dawsholm gas-works of the Glasgow Corporation. He was not long there, before the post of Manager of the Edinburgh Gaslight Company's works became vacant; and he was the successful applicant for it. As in Glasgow he had Mr. W. Foulis, the Engineer, over him, so in Edinburgh he was subordinate to the late Mr. J. K. Watson, who was Treasurer and Manager of the Company. Mr. Mitchell went to Edinburgh in 1881, succeeding Mr. Henderson. In 1886, the Company sought parliamentary powers for the transfer of their works from the confined site in the Old Town of Edinburgh to a field on the estate of Niddrie, several miles out of the city. The plans of the proposed new works were prepared; and these must have entailed a vast amount of labour upon Mr. Mitchell. The Niddrie scheme did not go on; the Corporation, after acquiring the Company's undertaking, having resolved to retain the old works. The plans are now in the possession of the Gas Commissioners. Mr. Mitchell was proud of them. He had the sketch plan framed, and hung in his office; and very shortly before he retired, he remarked to the writer of this notice that he would not be surprised though they might be utilized yet. Mr. Mitchell was not destined to see a new and beautiful works rise under his superintendence. On the contrary, he was, by resolution of the Gas Commissioners to remain where they were, condemned to practical slavery for the remainder of his days. The works were old; and the Gas Commission, which came into existence in August, 1888, were not long created before they required him to prepare plans for re-construction. The retort-house has been all but re-built; and the retort-bench is also new—having been converted into a series of regenerative settings. An overhead railway has been introduced, two large and important extensions of mains have been carried out, new offices have been built in the works, and carburetted water-gas plant was all but completed when he left. Before the transfer, he had erected tower scrubbers and re-constructed the purifier-house. It is safe to say that, during the sixteen years he was in Edinburgh, he was not a single year free from the troubles attendant upon the preparation of plans, or the execution of works, in re-building and extending. To crown all, two years ago the chimney in the works—the tallest gas-works chimney in the world—showed signs of giving way; and a new chimney has been built to take its place. The old chimney is still standing, though it is likely to be removed this year. But its existence, literally on the swing—for it has been going and coming—has been a source of great anxiety. In addition to all the labours he had in the renovating of his works, Mr. Mitchell had all along to struggle against a lamentable want of room in what he recently described as the "dirty little corner." When he went there, the works were looked upon as being small enough for the make. But since then, the output has doubled; and the necessary extensions of works to meet the increased demand for gas, have been crowded into the same site. The worries of his position some years ago began to tell upon Mr. Mitchell's health. He suffered from liver complaint. For the past five or six years, he may be said to have scarcely ever been right. He took a trip to America, which did him some good; but his enemy insiduously crept upon him again. Last year he asked, and obtained, a three months' holiday, in order to take a voyage to the Cape. His medical adviser forbade him to take a sea voyage. But he went nevertheless, and returned apparently considerably set up, and evidently feeling so himself, for he said that the voyage had added fifteen years to his life. Very soon, however, he was in as bad a condition as ever; and in December he reluctantly gave in, agreeing to retire at March 31 upon a pension of £250 a year. The proposal was that both he and his colleague, Mr. F. T. C. Linton, of the Leith works, should retire. But on the morning of the day on which the Commissioners were to meet so to resolve, Mr. Linton's death was announced. The resolution regarding Mr. Mitchell was, however, adopted; and, in terms of it, he left the works at the end of March—the position which he and Mr. Linton held being then combined. As is well known, it is now held by Mr. W. R. Herring, late of Huddersfield. Mr. Mitchell has not lived long to enjoy his hard-earned rest. On being released from office, it was his intention to take a holiday with friends in the west of Scotland; but instead of this he took to his bed, and has never been about since. On Saturday afternoon, he was buried in the parish churchyard at Lasswade; his funeral being attended by a large number of his former friends and workpeople. Mr. Mitchell was always a great favourite with his workmen and staff. He was, in a sense, an easy master; yet, by his kindly method of dealing with them, he contrived to get a wonderful amount of work out of his men. His public life was almost entirely confined to his profession. He was in 1885 appointed Vice-President of the North British Association of Gas Managers; but on the death of Mr. L. Hislop, of the Partick, Hillhead, and Maryhill Gas-Works, he was obliged to take the chair at the meeting in Edinburgh in 1886. On this occasion he was elected President; and in that capacity he presided at the meeting in Stirling in 1887—thus serving practically two years as President, a circumstance which has only once otherwise been experienced, when Mr. John Reid, of Leith, succeeded Mr. W. Proctor, of Forfar, in 1867. Mr. Mitchell was President of The Gas Institute, and presided over the Edinburgh meeting in 1895. He was a member of several other technical societies. He was only 47 years of age, but looked a good deal older. He is survived by a widow and a family of five.

NOTES.

The Sampling and Analysis of Coke.

Mr. W. F. Keating Stock read a paper on the "Sampling and Analysis of Coke, and the Valuation of Coal for Coking Purposes," before the last meeting of the Newcastle Section of the Society of Chemical Industry. This subject, it was observed, is of very great practical importance; yet it is one which does not possess anything like a settled technical style of treatment. The literature of coke is very scattered and fragmentary. The matter of sampling coke for analysis is a case in point. The results shown by the most careful analysis may be nullified by improper sampling of the bulk. Mr. Stock enumerated six different ways of taking a sample of coke, only one of which received his approval. This was described, but is too lengthy to quote in full from the "Journal" of the Society. Having secured a 100 gramme sample, it is first to be tested for moisture by drying for three hours at a temperature not exceeding 105° C. The loss is recorded as moisture. For the ash, 1 or 2 grammes of the finely-powdered coke are ignited in a platinum crucible at a bright red heat, until no further loss of weight is noticed. The ash determination is always done in duplicate; the greatest permissible difference

between the tests being 2 milligrammes. For the estimation of the sulphur in coke, many plans have been proposed. Since 1874, Mr. Stock has used a test of his own devising, which he calls the lime method. This consists in heating the coke to redness with an equal weight of half-hydrated caustic lime until all the carbon has disappeared. The assay is subsequently treated with bromine and barium. With regard to the capacity of coke for holding water, the author gives some interesting particulars. By experimentally soaking pieces of hard coke in distilled water for 24 hours, it was found possible to make the coke take up 19·17 per cent. of moisture; but Mr. Stock has met with no such proportion in practice. In 1894, he followed 16 trains of coke from various localities to their destination, after a heavy rainfall of some hours' duration. All these cokes were analyzed afterwards by himself, after careful sampling. The lowest moisture was 2·30 per cent., and the highest 12·36 per cent.—average, 5·25 per cent.

The Oxidation of Carbon at Normal Temperatures.

The Cox thermo-generator, of which mention has been made in these columns, was recently brought into public notice again in the course of a lecture delivered by Mr. Willard E. Case to the members of the New York Electric Society. The example shown was said to consume 2½ cubic feet of gas per hour, generating 12½ watts. Another thermo-generator exhibited by the lecturer was the one invented by Bradley and Crocker, which consisted of an iron vessel 2½ inches in diameter and 6 inches deep, placed inside a retort and heated by a gas-flame near to redness. The electrolyte of the cell is caustic soda, with peroxide of manganese added, forming sodium manganate. In the compound is immersed the electrode of carbon, constituting the positive pole; and when the circuit is closed, a current flows of 3 ampères at 1 volt. Mr. Case also described the Jacques cell, which is a modification of the Bradley and Crocker device; the only difference being that in the former the peroxide of manganese is dispensed with. It yields the same quantity and strength of current. Experience with these cells has led Mr. Case to think that the theory of their action, which is most uncertain and erratic, is by no means well understood. In connection with the operation of another carbon cell devised by the lecturer, in which the active agent is nascent peroxide of chlorine, it was discovered that the classical determination by Andrews of the energy content of coal, proceeding from the calorific value of 14,544 British thermal units for the complete oxidation of a pound to carbonic acid, is probably too low. From experiments with this cell, which operates at a low temperature, the lecturer claimed to show the possibility of oxidizing carbon by oxygen under this condition. He proceeded to argue that, as this is precisely what is done by animal bodies, which are admittedly efficient machines, there is no reason to think that it is necessary to use high temperatures. His suggestions for future research are: "Keep without the second law of thermo-dynamics; search for a suitable carrier of oxygen (or some cheap source of oxygen supply) and hydrogen and carbon, or a carbon compound easily oxidized."

Mixed Portland Cements.

In view of the action of manufacturers of some brands of portland cement in the matter of adding foreign materials to the products, Dr. William Michaelis has been engaged in an investigation into the behaviour of pure and "doctored" cements under a variety of conditions, the preliminary results of which have been published. He has found that the admixture of trass (and of puzzolanas in general) with over-limed binding agents, portland cements, and hydraulic limes, is capable of raising the strength of mortars made with these to two or three times what it would otherwise be, and to make these materials permanently sound in sea water. Inasmuch as the best puzzolanas contain at least as much of the hydraulic factors as the best portland cement, it follows that, from the union of these materials, a hydraulic mortar of redoubled strength results, since portland cement contains a sufficient excess of lime to admit of the puzzolana attaining its full value. Obviously those admixtures which are rich in hydraulic silica and poor in alumina are the best; and for this reason, the addition of kaolin for marine constructions is not to be recommended. Since, then, according to this suggestion, mixed cements furnish a mortar not only much more durable and strong, but also considerably cheaper, it is desirable that these mixed cements should be as widely used as possible. Now that our knowledge of these things has been extended, and the real cause of danger in the use of cement recognized, the employment for marine constructions of hydraulic binding materials too rich in lime, without improving additions, should no longer be permitted. The solution of the problem is, moreover, the most favourable that could be imagined; the old methods still hold good. All that is necessary is to make a sensible use of the ancient, most effective, and, at the same time, cheapest hydraulic mortar formers, among which none takes a higher place than genuine trass—by which term is meant the finely-ground tufa (trass-stone), without any admixture of ashes or other substance. Other varieties of puzzolana, which possess a smaller degree of initial energy, are also quite available. A purely theoretical computation, together with practical, quickly effected tests, show readily in every case what mixtures are the best. This solution is claimed by Dr. Michaelis as possessing the rational recommendation of turning to good effect the otherwise destructive power of lime in portland cement.

COMMUNICATED ARTICLE.

APPARATUS FOR TECHNICAL GAS ANALYSIS.

[Translated from the "Berichte der Deutschen Chemischen Gesellschaft."]

In a recent communication to the "Deutschen Chemischen Gesellschaft," Herr Otto Bleier describes some new forms of apparatus for technical gas analysis.*

A Universal Gas Analysis Apparatus.—A gas analysis apparatus for universal use must not combine in a single instrument all the different attachments such as gas-pipettes, combustion-pipettes, &c., required in gas analysis. It is sufficient that the gas-pipettes coming most frequently into use should be permanently attached to the measuring-tube, while the construction should be such as to allow of the easy attachment of any other gas or explosion pipettes desired. This condition is fulfilled in the apparatus represented in fig. 1, in which each gas-pipette is connected directly with the measuring-tube by a special capillary in such a manner that all the necessary connections can be made with a single cock.

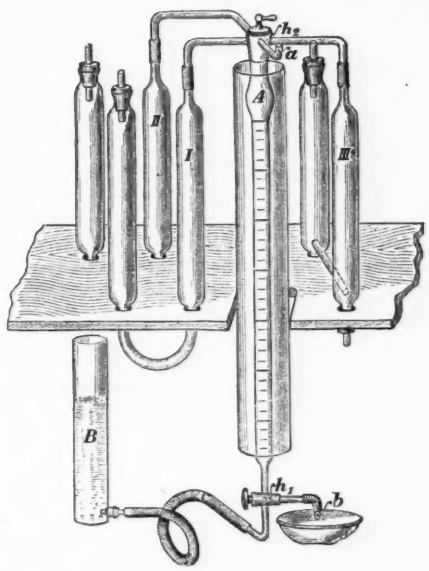


FIG. 1.

Description.—The water-jacketed measuring-tube A terminates below in the three-way cock h_1, which is connected with the levelling-vessel B. To its upper end the cock h_2 is fixed, by means of which communication can be made either with the capillary *a* or with the gas-pipettes I, II, and III. The measuring-tube holds exactly 100 c.c. between its two cocks; and with the exception of the upper portion (30 to 40 c.c.), it is graduated into fifths of a cubic centimetre. To the horizontal limb of the three-way cock a piece of capillary glass tube *b* is attached by means of a piece of flexible tube. The water from the measuring-tube requires from two to three minutes to escape from this capillary. The plug of the glass cock is provided either with a simple hole (as *a*, fig. 2), while a number of capillaries are placed on the same level round the barrel; or the plug may have a canal similar to that in an ordinary dropping-bottle (as *b*, fig. 2). In the latter case, however, the capillaries must not be affixed on a level, which is an advantage when the number of the capillaries is greater than four. The capillaries attached to the barrel of the cock are afterwards bent at right angles, and connected by means of india-rubber tube with the gas-pipettes, I, II, and III, which are of the form usually found in Orsat's apparatus. The whole apparatus is mounted on a wooden box (not shown), having holes cut in the cover.

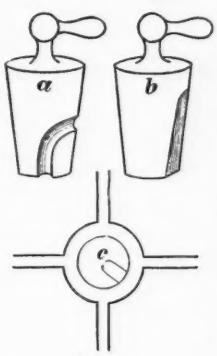


FIG. 2.

Manipulation.—After the operator has seen that the liquid in the various pipettes comes up to the glass cock h_2, the measuring tube A and the capillary *a* are filled with water by raising the levelling-vessel. He should then allow the gas which it is desired to examine to enter at *a* while the water is permitted to make its escape from the nozzle *b* into a basin, from which it can be transferred to the levelling-vessel, and used over again. By now turning the cock h_2 through an angle of 90°, the measuring-tube can be brought successively into connection with each of the various pipettes, and the gas passed over

* Improvements effected by Herr Bleier in other gas analysis apparatus were described in the "JOURNAL" for April 7, 1896 (p. 745).

for treatment with the reagent. Should it be desired to continue the analysis of the gas further than is afforded by the use of three reagents, the gas residue is retained in the third pipette, and the capillary *a* filled with water, and connected to the additional gas-pipette to be employed. The analysis can then be continued as though the measuring-tube were a Hempel burette. The measurement of the gas is always made in the tube A; and the absence of any graduation in its upper portion is rarely felt, since the residual gas almost always measures more than from 30 to 40 c.c. If it should happen that this is not the case, the measurement must be conducted in a levelling-vessel, a practical form of construction of which is shown in fig. 3. The lower portion is graduated for 50 c.c. into fifths of a cubic centimetre, while the upper part is enlarged. It is, of course, clear that the gas-pipettes which may be attached to the apparatus are not limited in number. The cock h_3 can make as many as six to eight connections; each second gas-pipette being provided with a special cock.

FIG. 3.

Capillary for Explosion.—The apparatus usually employed in gas analysis for exposing gaseous mixtures to the action of the electric spark or electrically heated wire, can be replaced with advantage by the explosion capillary of the form shown in fig. 4 which can be connected, if found necessary, to right-angled capillary tubes, as shown at *b*. The capillaries are enlarged about their centres into a bulb, into which either platinum electrodes are fused, as at *a* and *b*, or a platinum or palladium spiral can be introduced by means of a two-holed cork *c*. This latter form allows of the introduction of any desired electrode, such as magnesium electrodes for the preparation of argon.

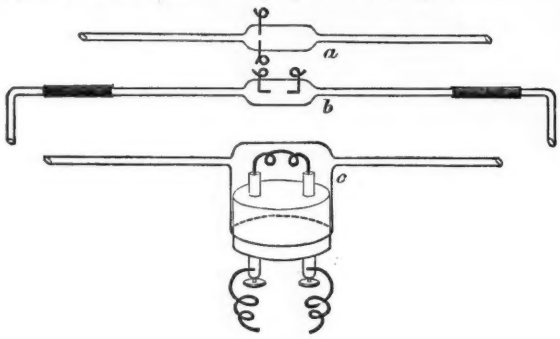


FIG. 4.

These explosion capillaries are used as follows: They are first connected to a gas-pipette and filled with water; then the free end is connected with the vessel, such as a gas-burette, containing the gas about to be examined, and the circuit closed, on which the electrical charge finds its way through the water. At this stage the gas is allowed to enter. By operating in this way, any desired mixtures of detonating gases can, by means of the explosion capillaries *a* and *b* be completely and safely exploded. This is done by leading the gas only once from the pipette to the burette. The explosion takes place only through the hollow bulb, and does not extend through the wet capillary. If the detonating gas is mixed with other gases (non-explosive), the explosion is not complete on the first passage of the gas, not even although the gaseous mixture is above the explosion limit.

The capillary *c* is particularly useful for the combustion of methane and other hydrocarbons. More accurate results than those given by a gas-burette can be obtained by connecting the apparatus for the titration of gas (described in the previous communication), through the explosion capillary *c*, with a gas-pipette or similar apparatus. The gaseous mixture is measured in the first apparatus, and after combustion the resulting carbon dioxide may be titrated.

Combustion of Nitrogen.—Since the discovery of argon, it has appeared worth while to undertake a direct estimation of nitrogen in the usual course of gas analysis. Up to the present time, the so-called "oxygen" method has been used for the purpose. It is carried out by interposing an explosion capillary between a gas-burette and a gas-pipette, both of which are filled with dilute alkali. The nitrogen, mixed in the right proportion with oxygen, is led to and fro in the capillary for a considerable time. In previous experiments made by the author along these lines, the speed of absorption of the nitrogen fell considerably short of that obtained by Rayleigh and Ramsay in their apparatus—sparks of the same length being used. But a quicker absorption is obtained by inserting several explosion capillaries in the current of gas in which the induction sparks break through in equal time. In practically employing this method for estimating nitrogen, it is as well to conduct the gas to and fro automatically, since the continual raising and lowering of the pressure vessel is wearisome. With the help of a Sprengel pump, the gas can be made to circulate in a manner similar to that employed by Professor Ramsay in his so-called magnesium method for the estimation of argon.

TECHNICAL RECORD.

MANCHESTER DISTRICT INSTITUTION OF GAS ENGINEERS.

Spring Excursion Meeting at Preston.

The Quarterly Meeting of the Institution (the 110th) was fixed for Saturday last, and proved in every respect a most successful gathering—thanks in great measure to the excellent arrangements made for the reception of the members by Mr. Henry Green, the Engineer of the Preston Gas Company, who, in consultation with the President of the Institution (Mr. Robert Porter, of Elland) and the Secretary (Mr. S. S. Mellor, of Northwich), had mapped out a very full programme for the day, combining both instruction and amusement for those who were fortunate enough to attend. There has never been a larger turn-out of members at any previous gathering, either for one of the ordinary business meetings or for the spring excursion. Train arrangements were made by which all the members could reach Preston by 11 o'clock. There they were received by Mr. Green and his son, Mr. Herbert Green, and a visit was at once paid to the Harris Free Library and Museum—an imposing block of buildings close to the Guildhall and Market Place, where has been got together a most interesting collection of statuary, antiquities, and ancient and modern pictures, besides the reference and lending library for which Preston has long been noted. After an hour pleasantly spent in strolling through the rooms of the Museum, an adjournment was made to the Public Hall, where, by invitation of the Chairman and Directors of the Preston Gas Company, the members sat down to an excellent luncheon. At its close, the ex-President (Mr. Isaac Carr, of Widnes) proposed a very hearty vote of thanks to the Directors of the Company and Mr. Green for their hospitable reception, and for the interest in the Institution evinced by the presence of the Chairman of the Company (Mr. Benjamin Sykes, M.Inst.C.E.) and two other members of the Board. Mr. G. E. Stevenson seconded the vote, which was passed by acclamation, and suitably responded to by Mr. Sykes. A move was then made for the Moor Lane gas-works, a thorough inspection of which occupied the members for a full hour and a half; the main interest, of course, centring in the purifying arrangements for the works. Seeing that as recently as November, 1895, a description of this plant appeared in the "JOURNAL" with illustrations of the purifying-house referred to,* details are not necessary on the present occasion. The members then drove through the town to the Preston Docks, to embark on board a steamboat which the Preston Corporation had arranged to place at the disposal of the party for a trip to Lytham. Arrived there, tea was served at the Clifton Arms Hotel; and at its conclusion, the only formal business of the day was transacted. This consisted in the confirmation of the minutes of the previous meeting (held in Manchester in February) and the election of seven new members—Mr. E. J. Brockway, of Cleethorpes; Mr. W. Dunn, of Askern; Mr. J. Gibson, of Beverley; Mr. E. A. Harman, of Huddersfield; Mr. H. Hawkins, of Todmorden; Mr. G. Moat, of Purston; and Mr. W. Moys, of Ossett. Most of the members left Preston shortly after 7 o'clock; and so ended what—thanks to the fine weather prevailing—proved a very enjoyable though long day's excursion.

EXPLOSION FLAMES.

At the Royal Institution last Friday week, Professor HAROLD B. DIXON, M.A., F.R.S., of Owens College, Manchester, lectured on the above subject. It is impossible to convey an adequate idea of all the interesting matter the lecturer laid before his audience, as step by step he illustrated it by experiments and photographs of results obtained in the course of his own and other investigators' researches.

Professor Dixon commenced by referring to the great interest attaching to the study of explosion flames. Experiments on the rates of explosion had, he said, shown that the velocity of the flame was comparable in many cases to the mean velocity of the molecules, calculated according to the well-known molecular theory of gases; and therefore they lent some support to that theory. Apart from this, there were other questions, such as the dissociation and the specific heat of gases at high temperatures, on which light might be thrown by the study of explosion flames. It was some years ago that he gave in that theatre a discourse in which he included an account of Berthelot's discovery of the explosion wave in gases; and he (the lecturer) demonstrated the rapidity of the flame by means of a tube hung round the theatre. He drew attention to a number of facts which Berthelot had brought forward indicating the connection between the velocity of the explosion and the velocity with which the molecules moved. He ventured to criticize the theory in the form in which Berthelot had placed it before them; but he did not venture to suggest any alternative. Two years later, additional experiments led him (Professor Dixon) to suggest an alternative hypothesis, in which

* See "JOURNAL," Vol. LXVI. (pp. 918, 922).

he compared the rate of explosion with that of sound in the burning gas. He would not trouble his audience that night with an account of the experiments on the rate of explosions; but he wished to draw attention to some of the rates measured, because those rates bore upon some of the experiments that he wished to show.

The lecturer proceeded to comment upon a number of tables exhibited in the theatre--mentioning, in the course of his observations, that cyanogen had thrown more light on the theory of combustion than any other gas that had been tried. Cyanogen, fired with its own volume of oxygen, gave 2728 metres per second; but if more oxygen was added, the rate was slower. Text-books, he also remarked, told us that carbon burnt first to carbonic acid; but he ventured to think that carbon first burnt to carbonic oxide, and that the extra oxygen, so far as the explosive wave went, was simply in the way—more in the way than so much nitrogen. The first burning of carbon was to carbonic oxide; and whether they had such a gas as cyanogen, which only formed carbonic oxide and carbonic acid, or whether they dealt with hydrocarbons, the carbon contained in these compounds burnt first to carbonic oxide, and secondly to carbonic acid. There was a satisfactory agreement between the experimental numbers obtained by Berthelot and himself; and he showed numerous figures in which they agreed in nearly every case. There was only one instance in which they were more than 5 per cent. in disagreement; and in this case some photographs exhibited by the lecturer explained the small difference. There was satisfactory agreement as to the rates at which a flame travelled in a tube filled with a mixture; but there was no satisfactory accord between the work of different experimenters as to the pressures, temperatures, and duration of flames—their results widely differed.

Alluding to the experiments of previous investigators, Professor Dixon remarked that first of all they had Bunsen's work in 1867. He was the pioneer worker on the explosion of gases; and the lecturer showed a sketch of the apparatus he used. He fired a mixture of gas—using hydrogen and oxygen chiefly—in a small tube; and he arranged to fire the gas from end to end by a long spark passing through the tube. The top of the tube was fastened by a plate kept down by a weight and long lever; and he could alter the pressure by slipping the weight along the lever. He then determined whether the lever was raised or not by the force of the explosion; and in this way he got the pressure produced in the tube. He also calculated from this what the temperature must have been when it reached its maximum. Briefly, his results were these: That, in the combustion of gases, there was not a progressive combination between the two constituents; but there was a discontinuous combustion. In the case of oxygen and hydrogen, Bunsen said that only one-third of the whole gas burnt at first; and there was then an arrest of all combustion, until the whole cooled down to a temperature at which another third could be burnt. At a still lower temperature, the last third burnt. This remarkable result was compared by Bunsen with some others he had obtained on explosion of mixtures of gases. He (the lecturer) thought that Bunsen—great pioneer that he was in this subject—generalized perhaps from too few experiments; he allowed himself to lay down some fundamental laws in chemical physics on some five or six experiments. Later work had not justified this. It had been found that the burning was not discontinuous, but continuous.

The next work on the subject was that of Berthelot and Le Chatelier. Both exploded mixtures of gas, and endeavoured to measure the pressures produced by observing the movement of a piston, or the bending of a Bourdon gauge. The pressures they registered were not very unlike those obtained previously by Bunsen; but they did not get any evidence of discontinuous combustion. The pressures were, roughly speaking, about one-third those which one would calculate theoretically; and they attributed this low pressure, not to a discontinuous combustion, but to a rise in the specific heat of the gaseous products. The first apparatus used by Le Chatelier showed, indeed, far higher pressures than those found by Bunsen. With the delicate indicator of Deprez, very slight movements of the spring could be detected; but Le Chatelier pointed out that, with this apparatus, the pressures found were so fugitive—lasting such a short time—that they did not indicate the pressure of the whole mass of the gas. They were not what he called "effective pressures," which could be utilized in moving a piston. He accordingly rejected this apparatus, and made a gauge that was less sensitive to pressures. What these investigators had measured was the average pressure in a large mass of gas through which the wave had passed. What we desired to know for the theory of explosions was the pressure generated for the moment in the wave itself. This was a very difficult problem.

Professor Dixon here drew attention to a series of pressures calculated according to the formula of Riemann, given as long ago as 1860. By a mathematical investigation of wave motion in gases, he showed that the pressure of the wave could be calculated if one knew the density of the gas and the rapidity with which the wave was moving. They now knew the rapidity with which the wave moved, and could therefore calculate the pressures produced in the wave, according to Riemann's equation. According to this calculation, the pressures produced in the explosion wave were about four times greater than those measured by Berthelot and by Le Chatelier.

There was one other way, besides the use of a moving piston, by which instantaneous pressures might be measured. Professor Dixon did not think it could be very exact; but it might give them some idea of these instantaneous pressures. He alluded to measurement by fracturing a tube of glass. If a mixture of explosive gas was placed in a glass tube, and an explosion was set up, of course it might break the tube; but by taking several tubes—each slightly differing in diameter from the one before—they could find the one that would break, and the next that would hold. They might test these hydraulically, and measure the pressure they would stand. If there was any relation (and he thought there was) between the hydraulic pressure a tube would stand and a strain suddenly applied by an explosion which it would just stand, then they had a means of determining the pressures produced in the explosion waves. He had tried this method; and the pressures measured in this way very closely corresponded to the pressures calculated from Riemann's formula. For instance, when cyanogen was mixed with an equal volume of oxygen and an equal volume of nitrogen, the rate of the explosion wave produced in this mixture was 2400 metres per second. The pressure calculated according to Riemann from this velocity was 71 atmospheres. A tube that would just stand this explosion was found to break under a hydraulic pressure of 84 atmospheres; while a tube that would just not stand the explosion was found to break under a pressure of 63 atmospheres. The argument, therefore, was that the pressure in the explosion lay between 63 and 84 atmospheres; and this corresponded with the theoretical pressure that was calculated by Riemann—viz., 71 atmospheres.

Le Chatelier, said Professor Dixon, was the first to apply the photographic method of registering what happened in the explosion of gases. The eye itself was a very bad instrument for measuring differences—it was not very discriminating; and, he humorously remarked, it had a very bad memory. The photographic plates or films now used were discriminating; and the record was permanent. Le Chatelier took certain mixtures—slow-firing mixtures—and fired them in a glass tube; and he at the same time photographed the flame on a moving film as it traversed the tube. Professor Dixon threw on a screen some of the images obtained by Le Chatelier. They proved that, when a slow-burning mixture was fired at the open end of a tube, it burnt at first at a perfectly uniform rate. Then at a certain point along the tube, vibrations were set up; and these continued for a certain time, and then stopped. Several things might then happen—either the flame might be extinguished, or the original slow form of burning recommenced, or the flame might begin to travel at enormous velocity. Professor Dixon here illustrated the actual effects shown by the photographs, by a mixture of nitric oxide and carbon bisulphide, and then by coal gas and air. In firing a mixture of the latter at the closed end of a long glass tube, he remarked that explosions of gas wanted something to kick against—they could not start rapidly unless they had something hard to set their feet against. This was not only true of slow explosions which could be followed with the eye, but also of the very rapid explosions which could only be followed photographically.

So far, the lecturer said, he had only spoken of slow explosions. An explosion wave itself travelled hundreds and thousands of times faster than the flames which had been witnessed. The eye was not a sensitive instrument to observe either the difference in rate or the difference in intensity; but by experiment with electrolytic gas in a bent tube, he showed the difference (to use his own words) as well marked as one could get it. This experiment was followed by one in which the same mixture of gas was made to shatter a glass tube, by which means the same fact was "brought to the ears in a way one could easily distinguish." He then directed attention to a photograph of the beginning of an explosion wave taken by Von Oettingen in 1888. The method he employed was to use a strong glass tube about $\frac{1}{2}$ inch diameter. This he placed vertically; and by means of a rotating mirror, he threw the image on a photographic lens, and so obtained a picture. He found in using hydrogen and oxygen that he got very poor pictures; and those he finally obtained were got by placing a metallic salt—copper chloride—in the tube. The lecturer pointed out that it would be seen, by the photographs thrown on the screen, that the audience were not looking at the light of the gas itself, but at the light of the heated salt, which was volatilized and made incandescent by heat of the gas.

This led Professor Dixon to refer to the well-known papers by Professors Liveing and Dewar on the spectra of metallic salts heated by an explosion of gases. These investigators found that they could observe and photograph the spectra of metals heated by the explosion flame. When the flame was made to travel towards the observer, some of the lines were *reversed*. For instance, when some lithium salt was placed in the tube, the red line of lithium observed in the spectrum looking end on was reversed; and the natural conclusion was that the explosion flame was *cooler* in front than it was behind. Of course, the experiment only showed that the *metallic vapour* was cooler in front than it was behind. The heated gases required time to raise, volatilize, and bring the metallic vapour to incandescence. The photographs of Von Oettingen showed that the explosion itself might hardly be visible; but, after it had passed by, the gases gradually heated up the metallic salt. Coming to his own

experiments, Professor Dixon said they showed that the explosion flame began with most marvellous sharpness—it did not begin gradually, but with a sudden intensity.

As the lecturer had pointed out, carbon in the form of gas burnt first to carbonic oxide. In the case of the burning of hydrocarbons, the explanation given had always, he said, been that the carbon was liberated from the hydrocarbon because the hydrogen burnt first—because the hydrogen was more readily oxidized than the carbon. He did not think this could really be so; it seemed to him the carbon was the more active of the two, especially when they started in a gaseous condition. Marsh gas, ethylene, and acetylene all burnt when mixed with oxygen in the same way. The carbon appeared to be the first to burn, forming carbonic oxide; if more oxygen were present, the hydrogen and carbonic oxide were both oxidized—the hydrogen more rapidly than the carbonic oxide. Ethylene, mixed with its own volume of oxygen, might burn theoretically in a number of ways; but what really occurred was shown by the equation—

$$C_2H_4 + O_2 = 2CO + 2H_2$$

The lecturer proved by firing the mixture in a closed tube that the volume of gas was doubled by the explosion, and that the products consisted of an inflammable mixture of carbonic oxide and hydrogen.

Professor Dixon next directed attention to some results he had obtained by photographing an explosion wave on a very rapidly moving film. The problem was to determine what an explosion wave was to look at if one could see it standing still for a moment. Unfortunately, it was moving at a velocity of between 2000 and 4000 yards a second. He first tried indirectly to get a notion of what the flames were like; and the first experiments he made were with two mixtures of cyanogen —in one case, with its own volume of oxygen; and in the other, with double its volume. As had been seen by his experiment, the first mixture exploded much faster than the other. The formation of carbonic acid appeared to be due to a secondary action—the cyanogen burnt first to carbonic oxide, and then in the rear of the wave followed the secondary combustion. If this was true, it would follow that the column of heated gas in the tube would be longer in the second case than in the first, where it burnt completely to carbonic oxide at once; and, the column being longer, it ought to give a longer image, if one made it either pass a window before which one moved a photographic plate very rapidly, or if one made the explosion wave break the vessel and throw out the gas which continued to burn after the explosion wave had reached the end of the tube. The latter was the first method he attempted. He fired a mixture at the bottom of a tube; and photographically measured the jet thrown out at the top. If the combustion of gas was rapidly completed—if the column of burning gas was very short—then a very little jet would be thrown out; whereas, if the column of burning gas was long, a large jet would be thrown out. He found, when the cyanogen was burnt to carbonic acid, he got a long jet; and when it burnt to carbonic oxide, he got a short one. After these experiments, he passed on to consider how he could get the explosions photographed on a moving film. He found Eastman's films were exceedingly sensitive to light. He made a wheel about a yard in circumference, which could be spun round with a motor very rapidly; and on the circumference of this the film was fixed. He found a convenient velocity for the wheel was about thirty revolutions a second—roughly, 60 miles an hour. The wheel was enclosed in a camera. Then he had a lead pipe, containing a small glass window; and he photographed the image of the window lit by the flame as it passed along the tube. When cyanogen was fired with oxygen in the tube, the illumination of the window was very different according as the gas was burnt to carbonic oxide or to carbonic acid. In the first case, the window was very brightly illuminated for a short time; in the second case, the window was less strongly illuminated for a comparatively long time. In both cases, the commencement of the explosion wave was seen to be sudden.

In the latest experiments, the explosions were made to travel through horizontal glass tubes; and the flames were photographed on a vertically moving film. If the film remained stationary, one got a horizontal line of light crossing the film. But if, while the flame was traversing the tube, the film was moving downwards, instead of getting a straight line, one got a line compounded of the two motions—of the horizontal motion of the flame along the tube, and of the vertical motion of the film itself. It was discovered that the wave was reflected from the end of the tube; and this reflected wave was visible as a line of light in the photographs. The angles which these lines made with the horizontal told them the rate at which the waves were travelling; they were the explosion wave itself, and a "compression" or "sound" wave propagated through the still burning gas. From the velocity of these sound waves, one could calculate roughly the temperature of the gas after the explosion wave had gone by. The temperature of the gaseous mass, as calculated from the velocity of these sound-waves, approximates to the temperatures measured by Bunsen and Berthelot. It would appear then that the measurements obtained by these investigators do not apply to the explosion-wave itself, but to the whole mass of gas, heated up by the passage of the explosion wave, and still in most cases undergoing certain chemical changes.

REGISTER OF PATENTS.

Generating Acetylene.—Webb, G., of Shepherd's Bush, and Kelly, J. W., of Finsbury Pavement, E.C. No. 10,725; May 18, 1896.

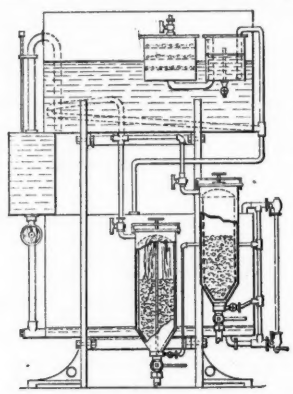
The patentees claim the use of a chamber or gasholder carrying a vessel containing calcium carbide fitted with a central tube; the chamber or holder being in connection (by means of a valve operated by a weighted lever) with a collapsible bag containing water, and provided with a weight for the purpose of forcing some of the water into contact with the carbide, so as to generate gas when the pressure of the latter has become reduced.

Mantles for Incandescent Gas-Lamps.—Duke, J. F., of West Dulwich. No. 13,639; June 20, 1896.

The patentee proposes to dip the mantles—preferably when they have their usual coating of collodion—in a cold saturated solution of barium chloride; and when dry, they are submitted to a high temperature for a sufficient length of time to drive out the acid, and thereby reduce the barium salt to barium oxide. The heat (in addition to converting the salt into oxide upon the surface of the mantle) has the effect of producing a slight fusion of the refractory metals of the mantles, "so that they become sufficiently united for the barium oxide to be permanently retained;" and this union, it is said, also "increases the resiliency of the mantles, rendering them stronger and more durable." The coating of the mantles with barium oxide, it is claimed, has the further advantage of greatly increasing their lighting power, and of obviating the tendency of the light to acquire a greenish colour in course of time. This is said to be due to the following reason: It is a known physical property of barium oxide to absorb oxygen from the air at a high temperature, and to give up the oxygen at a slightly lower temperature. When a mantle coated with barium oxide becomes incandescent, the inner side of the mantle remains at a slightly lower temperature than the outer side, which is in contact with the atmosphere, because the gas impinges on the inner side, and tends to cool it. The result of this is that the coating of barium oxide on the outer side absorbs oxygen from the atmospheric air, and, as it were, becomes a carrier of the oxygen from the atmosphere outside the mantle to the gas that impinges upon the inside of the mantle. Consequently, as the gas receives an increased supply of oxygen, a higher temperature and greatly increased light are said to be produced.

Generating Acetylene.—Haviland, F. H., Holloway, A., Collier, J. B., and Murch, W. H., all of Bournemouth. No. 15,122; July 8, 1896.

Apparatus according to this invention (as shown) is constructed as follows: A main water-cistern is divided by two horizontal diaphragms into three compartments—the upper filled with water from any convenient source of supply, while the lower constitutes a gasholder. In the space between the two diaphragms, or on the same level outside the cistern, is a small tank closed at top and bottom. From the top of this, a syphon-shaped pipe connects the interior of the tank with the main cistern; and there is also arranged a small vertical vent-pipe having a cock, by means of which the upper end of the small tank can be opened to the atmosphere. From the underside of the tank, a pipe passes to a point



near to the bottom of the lower compartment, which forms the gasholder. To one side of the cistern is attached a generator, in which the calcium carbide is placed; and from the bottom of the holder, a pipe is carried to the lower end of this generator. It is arranged in such a manner that the water can only reach the calcium carbide by passing through a wick, and preferably also through a perforated metal cylinder in an annular space surrounding the carbide. Or it may be arranged to drip upon the carbide in a generator at a lower level. A pipe passes from the upper part of the generator to a purifying and drying chamber, whence the gas can issue either to the supply-pipe or to the holder.

The apparatus operates as follows: The cistern and tank being filled with water, and the lower compartment containing both gas and water, it follows that as soon as the water enters the generator, and percolates through the wick and perforated metal cylinder to the calcium carbide, acetylene is generated. If the supply-pipe is open, a portion passes off to the point of consumption; while the excess enters the gas and water holder, and forces the water back into the tank until the water-level in the holder is below the mouth of the pipe which conveys water to the generator. The water then ceasing to pass, gas is not generated; and the pressure diminishing (by reason of the gas being consumed) the water once more rises, and reaching the carbide more gas is generated, and the water is once more forced back into the tank.

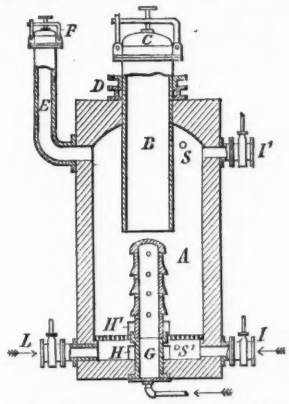
Production of Water Gas.—Dellwik, C., of Stockholm. No. 29,863 Dec. 28, 1896.

The object of this invention is to secure, in the production of water gas, the admission during the air-supply period of such quantity of air

(or the use of such air pressure) as to obtain "the most perfect conversion possible of the fuel to carbonic acid, so that the combustion gases of the air-supply period always contain more carbonic acid than carbonic oxide."

The object is attained by regulating the proportion between the height, volume, and size of fuel employed and the amount of air admitted, in such a manner as to cause complete combustion of carbon to carbonic acid. The exact proportion varies, of course, in accordance with the nature of the combustible material employed, and other circumstances; and it must be determined experimentally in each separate case. For coke of average size, for instance, it has been found that, with an air pressure of 210 mm. under the grate and 60 mm. above the layer of coke—that is, with an absolute pressure of 150 mm. in the layer of coke—the height of the latter should be about 1200 mm., in order to obtain combustion gases nearly free from carbonic oxide, and containing about 20 per cent. of carbonic acid. This height of coke is also sufficient to completely decompose the steam admitted during the period of gas production. According to whether it is desired to use the fuel in layers of greater or less height, the air-supply pressure is increased or diminished so as to produce in each instance during the air-supply period complete combustion of the fuel to carbonic acid. To this end, it is equally practicable to regulate the height of fuel in accordance with a given pressure of the air supplied, as to make the reverse adjustment—*i.e.*, to proportion the pressure of air in accordance with a given height of fuel. But in all cases experiments will indicate a certain definite proportion according to which, for a given pressure of air supplied, a certain definite height of fuel must be maintained.

For the application of the invention, any water-gas apparatus may be used, if only the height of coke is regulated by frequent and regular charging in of fresh fuel, so as to keep it at an approximately constant level, to ensure complete combustion to carbonic acid according to the pressure of the air supplied. It is, however, preferable to use an apparatus in which the height of coke is maintained constant in an automatic manner, and having an adjustable coal receptacle. Such apparatus is represented in the illustration.

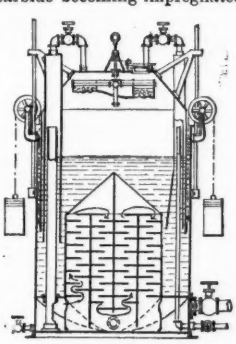


A is the generator, provided with a fuel receptacle B (of cast iron), passing through a stuffing-box D placed on the top of the generator. Under the grating is arranged the main air-inlet L and the gas-outlet I and steam-inlet S^1. The generator is also provided with cleaning-doors H H^1. In the upper part, there is an outlet-pipe E (for the combustion products), closed during the period of the production of water gas by the valve or cover F. I^1 is an outlet for water gas; and S is a second steam-inlet. The receptacle B is charged with fuel, and then closed by the cover C. The air-inlet under the grate is preferably continued into the layers of fuel by a pipe G, provided with numerous air nozzles or apertures, so that thorough contact of the air with the whole mass of fuel is obtained.

When the proper height of a given description of fuel for a given amount of air pressure has been determined by testing by means of the adjustable receptacle B, the cast-iron receptacle is advantageously replaced by one made of fire-bricks.

Generating Acetylene Gas.—Boult, A. J.; a communication from H. F. Fuller, of Chicago, U.S.A. No. 1440; Jan. 19, 1897.

A serious obstacle encountered in the use of many forms of acetylene gas generators, the patentee points out, is the impossibility of preventing the entire charge of carbide becoming impregnated with moisture, since

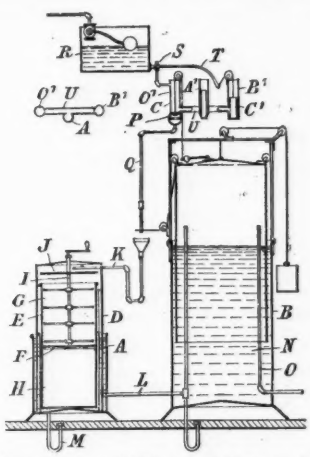


—the supply being in one mass, presenting considerable surface area to the water—even if the latter contacts only with the base of the mass, it will soon become saturated by capillary absorption throughout, and thus be rendered continuously active in evolving acetylene gas, notwithstanding that the confined pressure of the generated gas forces and maintains the water out of contact with the carbide. Further difficulty is the failure to obtain adequate condensation of the moisture carried by the gas, and adequate cooling before it leaves the apparatus; and a still further difficulty has been the tendency to leakage at the manhole which is necessary to effect the charging with solid material.

The first obstacle named is overcome in the apparatus shown in the engraving by preventing contact of the liquid at one time with a greater portion of the solid material than shall be required to maintain the desired quantity of gas in the apparatus, by supporting the carbide in such a way as to cause it to be consumed progressively; the contact of the liquid with the carbide under the periodical drops in pressure, being on successively higher planes, and consequently on successive sections of the supported solid material. The second difficulty is overcome by providing a condenser and cooler within the generator in the form of a tank of smaller diameter than the generator, and extending upward from the bottom, whereby a water-space is formed between the tank and the wall of the generator. It is preferred to provide this tank with internal deflecting plates, giving it the character of a scrubber, whereby the gas shall pass through it in a tortuous course. The third difficulty is overcome by providing about the manhole an annular, transversely concave packing seat, and providing the cover with an annular flange, the under side of which is of slight transverse convexity as compared with the degree of concavity of the seat—thus forming with the latter a concavo-convex recess, and providing an elastic packing within this recess.

Production and Storage of Acetylene Gas.—Carter, R. F., of Niagara Falls, Canada. No. 2284; Jan. 28, 1897.

This apparatus for the production and storage of acetylene gas consists, essentially, of a generator adapted to contain a large charge of calcium carbide, and provided with an agitator, by means of which the carbide is stirred up so as to cause the lime formed to fall through a perforated diaphragm; and of means whereby a given quantity of water may be automatically thrown on the carbide when the supply of gas in the holder falls too low.



A is the generator; B, the gasholder; and C, the water measuring and feeding device. In the generator is a hollow cylinder open at its upper end, in which works a hollow cylinder D open at its lower end—thus forming a gas-tight chamber. E is a hollow cylinder open at each end, and centrally divided by a perforated or wire-gauze diaphragm F, so as to form a carbide chamber G, and the lime-pit H. I is an agitator made with arms fitted to a spindle provided with a crank for imparting a rotary motion to it. J is a perforated diaphragm or spray nozzle, overlying the open top of the cylinder E. K is a water-supply pipe, adapted to discharge its water through the perforated diaphragm or spray-nozzle, and bent to form a water-seal. L is a pipe connecting the upper portion of the generator with the interior of the gasholder. M is a condensation pipe and trap. The pipe L is also provided with a similar pipe and trap. The gasholder B comprizes the usual water-tank N, the walls of which carry guides on which run guide-wheels and a counterbalance weight. O is the gas-exit pipe.

The water measuring and feeding device C is constructed substantially as follows: There is a water-chamber O^1, provided at its lower end with a valve P adapted to fit a suitable valve-seat. From the lower end of the chamber, the pipe Q extends to a point above the funnel on the generator water-supply pipe K. R is a water-supply tank, from which the pipe Q extends to connect with the water-chamber. This pipe is provided with a cock S, to the stem of which is connected the lever T. The valve is so arranged that, when the lever is in the raised position (shown), the valve is open, and will then run at a rate preferably of about a pint in five minutes. U is a horizontal pipe connecting the water-chamber with the chambers A^1 B^1. These three chambers are practically equivalent to a single chamber; and such a chamber might be used. But the form illustrated is preferable, as a single large chamber would hold far too much water if a rise and fall sufficient to operate the cock S, by means of the float C^1, be allowed for. This float in the chamber B^1 is connected with the end of the lever T by a cord or chain passing over a sheave located at the top of the chamber, and is of sufficient weight to maintain the lever T in its raised position when the chamber B^1 is empty of water. When, however, the chamber is filled, the weight of the float is carried by the water, and the lever drops of its own weight, thus closing the cock. The valve P is connected with the top of the holder by a cord or chain passing over a sheave at the upper end of the chamber. The length of the cord is such that, if the holder drops below a desired level, the valve P will be raised, and the water in the chamber O^1 and its connections allowed to escape by the pipes Q and K to the generator.

Water-Meters.—Schreiber, C., of Paris. No. 3479; Feb. 9, 1897. Date claimed under International Convention, Oct. 30, 1896.

The novelty in this construction of water or similar fluid meter consists in the combination of a chamber divided into three compartments,

two of which contain the operating cylinders, while the third constitutes the discharge chamber, with a plate provided with communicating passages and an upper chamber into which the fluid is introduced (after having been freed by a grating from its impurities), and from which it escapes after having passed through a valve-chest, cylinders, and the exhaust chamber.

Gas-Engines.—Auriol, P., of Paris. No. 3890; Feb. 13, 1897. Date claimed under International Convention, Sept. 12, 1896.

This invention refers to an engine having two pistons moving in opposite directions in the same cylinder; and the characteristic feature of the proposal is the means described for transforming the rectilineal alternating action of the pistons into a continuous rotary movement, by transmitting the action of the pistons upon eccentrics through the medium of straps with friction balls. A distributing device is also described, composed of three parts, connected together by a series of differential gear-wheels, for the purpose of causing one part to turn at half the speed of the engine cylinder.

APPLICATIONS FOR LETTERS PATENT.

11,554.—Field, A. W., "Liquid measuring apparatus." May 10.
11,558.—Bennett, J. F., and Marples, R. H., "Electrical gas-lighting apparatus." May 10.
11,644.—Sutcliffe, H., "Gas-generators." May 11.
11,665.—Hunnex, W. E., "Chimneys for incandescent gas-lamps." May 11.
11,739.—Foster, F. R., "Incandescent gas-mantles." May 11.
11,745.—Hill, J. K., "Water-meters." May 11.
11,764.—Smith, C., "Acetylene gas-lamps." May 12.
11,801.—Fielding, J., "Igniting device for gas-engines." May 12.
11,838.—Courtenay, F. B., "Gas-producing apparatus." May 12.
11,873.—Jamieson, T., "Generating acetylene gas." May 13.
11,874.—Adams, M. J., "Gas-engines." May 13.
11,951.—Lamy, M. A., and Richard, C., "Internal combustion engines." May 13.
12,009.—White, C. & T. H., "Automatic flash-light for incandescent burners." May 14.
12,050.—Fairhurst, W., "Gas and other engines." May 15.
12,092.—Simmance, J. F., "Gas-regulators." May 15.
12,100.—Dreyspring, G., "Lighting devices for lamps." May 15.
12,102.—Arend, G., and Hüttrich, A., "Ball and socket joints for gasaliers." May 15.
12,110.—Trouvé, G., "Production and storage of acetylene gas." May 15.
12,120.—Campbell, C. H., "Gas-generators." May 15.

The Price of Gas at Salford.—The Salford Town Council last Wednesday adopted a proposal of the Gas Committee that, on the passing of the Bill now before Parliament, the price of gas should be as follows: Within a radius of five miles from Regent Road Gas-Works, ordinary consumers in Worsley urban district 2s. 6d., consumers of 250,000 cubic feet and upwards per quarter, 2s. 4d.; Barton rural district, ordinary consumers 2s. 6d., consumers of 250,000 feet, &c., 2s. 4d.; Prestwich, ordinary consumers 2s. 6d., c nsumers of 250,000 feet, &c., 2s. 4d. Beyond five miles from the Regent Road Gas-Works, the price would be for Barton rural district, Prestwich, Irlam and Cadishead, and Little Hulton, 2s. 9d. per 1000 feet to ordinary, and 2s. 7d. to large consumers; and in the Worsley district, 2s. 8d. and 2s. 6d. All these prices will be subject to a discount of 2d. per 1000 feet if the account is paid within one month of delivery.

Cape Town District Gaslight Company.—The report of the Directors of this Company for the past year states that the quantity of gas made was 94,083,000 cubic feet; being an increase of 4,131,000 cubic feet over the year 1895. During the year, the Directors paid off the £50,000 of 6 per cent. second mortgage debentures at 10 per cent. premium—the cost of redemption being £55,000—and made an issue of £75,000 of 4½ per cent. preference shares of £10 each at £10 16s. per share or £108 per cent.; the total amount realized therefrom being £81,000. The amount at the credit of the profit and loss account, including the balance brought forward, and after providing for debenture interest paid and accrued to Dec. 31, £2113 written off the preliminary and suspense accounts, and the debit of £3597 to the revenue account for the repairs and renewals of works, plant, mains, &c., is £8619, out of which £3000, being an interim dividend at the rate of 6 per cent. per annum, was paid in October last. The Directors now propose to pay a dividend at the rate of 10 per cent. per annum for the six months ending Dec. 31; making 8 per cent. for the year. This will absorb a further £5000, and leave £619 to be carried forward.

Gas and Water Accounts of the Rochdale Corporation.—In an article dealing with the financial position of the borough, the "Rochdale Observer" expresses disappointment with the accounts of the Gas Department for the past year. The profit twelve months ago—£6619—was £3500 less than the year before. This year there is a further drop to £5728; and the fall would have been still greater had it not been arrested by taking £900 from the reserve fund for work which, in an ordinary year, would have been charged to revenue. The large decrease in the profits reported twelve months ago was accounted for by lessened receipts for residual products; but during the past twelve months, the income on this account has gone up by £1293. The gas rental, however, was £189 less than the previous year; and coal and cannel cost close upon £1000 more. The extended use of the electric light by millowners and others has probably been the principal factor in checking the advance in the consumption of gas; and for this reason, as well as others, the recent decision of the Corporation to enter upon the electric lighting business is, in our contemporary's opinion, to be commended. Altogether the most satisfactory feature of the year's accounts is the further decrease in the deficiency on the Water Department. Last year it was £5855; and it is now £3862—a difference of £1993. This is principally accounted for by three items—a reduction of £793 in interest and £268 in the cost of repairs, and an increase of about £1000 in receipts for water supplies. There is again a decrease in the allowance for empty property—from £680 to £654.

CORRESPONDENCE.

[*We are not responsible for the opinions expressed by correspondents.*]

The Recovery of Cyanogen Compounds from Gas.

Sir,—For the past few years, the recovery of cyanogen compounds from gas has created considerable interest among gas engineers, who will naturally look to such a discussion as that which took place at the recent meeting of the Institution of Gas Engineers to supply them with data and information which may enable them to decide whether or not the new manufacture is likely to be profitable. Regarded from this particular point of view, one cannot but feel that the paper and discussion leave something to be desired.

In taking up a new process, the chemical possibilities must be ascertained before any other considerations can be wisely entered upon. In the present instance, this part of the subject has been skilfully and exhaustively worked up by Mr. Foulis, Mr. Hunt, Dr. Colman, Mr. Lewis, Mr. Cripps, and others; and no doubt can be left in any mind that crude coal gas contains cyanogen compounds which can be efficiently removed from it, and recovered as ferrocyanides of sodium, potassium, or iron, in quantity varying from 2 lbs. to 5 lbs. per ton of coal carbonized.

So far we are now on solid ground; and the next question would naturally be: What is the cost of recovering this crude salt? One looks in vain through the paper and discussion for any direct information on the point. After the clear exposition of the chemical process, it is quite possible for a chemical manufacturer to estimate the probable cost; but to practical men it would be much more satisfactory to have a statement of cost, based on actual working on an extensive scale over a considerable period. On the strength of a large practical experience of the manufacture of sulphocyanides and ferrocyanides, I have made an estimate of the cost of crude ferrocyanide cake made by the chemical scrubbing process, which works out to from £12 to £14 per ton, or (say) from 1⅓d. to 1½d. per pound. Perhaps some of your readers may be able to give actual figures for comparison with this estimate.

Having ascertained the quantity of ferrocyanide obtainable, and its cost, the next important points are the selling price of the crude cake and the markets in which it can be disposed of. Neither in Mr. Lewis's paper nor in the discussion is the selling price of crude ferrocyanide cake mentioned, though references are made to the fall in price of refined ferrocyanide of potassium and of cyanide for gold extraction. The present nominal price of *refined* ferrocyanide of sodium is 3½d. per pound, which gives a value of 2d. to 2½d. per pound for the crude ferrocyanide of sodium. Taking the cost of the crude at 1¼d., and its selling price as 2½d., a margin of profit of 1¼d. per pound is left, equal to from 2½d. to 5d. per ton of coal carbonized. This does not at all agree with Mr. Lewis's estimate of 9d. to 10d. per ton of coal; and it would be interesting to have details of the cost and selling price on which he has based his estimate.

In the discussion, a good deal of attention was devoted to the market outlets for ferrocyanides, and their possible development. It was mentioned that the principal outlets at present are for the manufacture of cyanides for gold extraction, dyeing, calico printing, and paper staining. To these might have been added colour making and case-hardening of iron forgings. It was plainly brought out in the discussion that the first of these outlets for ferrocyanides—viz., cyanide making—is becoming smaller year by year, owing to the adoption of newer and more direct processes for the production of high-grade cyanides. Out of a total of 1900 to 2300 tons of cyanide, which may be taken up for gold extracting during the current year, it is estimated that not more than 500 tons will be produced from ferrocyanides. There are cyanide works in Scotland and Germany which can easily produce all the cyanide likely to be required for gold extraction for some years to come, quite independently of gas-works or other ferrocyanides.

The chief hope for the ferrocyanide trade of the future is that present low prices may stimulate consumption for dyeing, calico printing, &c., and perhaps open up new outlets at present unthought of. There seems to be no doubt the competition of the future is to be between gas-works and sugar residue works; and how it will end no one can predict.

St. Kitts, Slateford, N.B., May 20, 1897. George Beilby.

The Carburation of Coal Gas.

Sir,—It is perhaps only a trifling matter, but I think it best to inform you of one or two errors made in the reproduction of the paper on the above in the "Journal" for Tuesday last. The errors referred to are in Tables VI. and VII. (pp. 1116, 1117). They should have both been headed "Copy of Working Sheet of Town Carburater," and numbered 10 and 45 respectively. Table VI. should be dated from Jan. 2, at 8 a.m., to Jan. 6, at 6 a.m.; and Table VII. from June 2, at 6 p.m., to June 7, at 6 a.m. I meant to have called your attention to these points at the meeting. Please do not think I consider you in any way responsible for these errors.

Hastings, May 21, 1897. Chas. F. Botley.

The Outlay on the Amsterdam Gas-Works.

Sir,—In the report of the discussion on my paper at the Institution of Gas Engineers (*ante*, p. 1132), I am made to say that "the total amount expended at Amsterdam," &c., was "something like a quarter of a million sterling." What I said was "a million and a quarter sterling."

Amsterdam, May 20, 1897. H. Salomons.

A Laboratory Gas-Burner.

Sir,—The needle-valve described as a new invention in your "Register of Patents" on p. 1136 of the last issue of the "Journal" is a very old arrangement. It has been in common use for certain forms of burners for at least fifteen years, and is an essential feature of our tube furnace burner for organic analysis. Its general adoption is barred by its cost, and also by the fact that it requires a little judgment to use. It is not an appliance which is suitable for the average user.

Warrington, May 20, 1897. Fletcher, Russell, and Co., Limited.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress has been made with Bills:—

Bills read the first time, and referred to the Examiners: Newark Corporation Water Bill, Rhymney Valley Gas and Water Bill.

Bills read a second time: Gas Orders Confirmation Bill (No. 1), Water Orders Confirmation Bill.

Bill read a second time and committed: Paisley Water-Works Provisional Order Bill.

Opposition withdrawn: Crowborough District Water Bill, Swansea Improvements and Tramways Bill.

Bills reported: Devonport Water Bill, Paisley Water-Works Provisional Order Bill, Weymouth Gas Bill.

Bills reported, with amendments: Arundel Gas Bill, Ashford Urban District Gas Bill, Deal and Walmer Water Bill.

Bills read the third time and passed: Chichester Corporation Water Bill, Eastbourne Water Bill, Fylde Water (Transfer) Bill, Hunstanton Water and Gas Bill, New Hunstanton Water and Gas Bill, Paisley Water-Works Provisional Order Bill, Perth Improvement Bill.

HOUSE OF COMMONS.

The following further progress has been made with Bills:—

Bill presented, and read the first time: District Councils (Water Supply Facilities) Bill.

Bills read the first time, and referred to the Examiners: Eastbourne Water Bill, Hunstanton Water and Gas Bill.

Bills read a second time and committed: Borrowstounness Water Provisional Order Bill, Duntocher and Dalmuir Water Provisional Order Bill, Local Government Provisional Order (Gas) Bill.

Bills reported: Bolton Tramways and Improvement Bill, Cirencester Water Bill, St. Neot's Water Bill.

Bills read the third time and passed: Colne Corporation Bill, Newark Corporation Water Bill, Tynemouth Gas Bill.

The returns relating to gas undertakings, made up to Dec. 31, 1896, and March 25, 1897, were presented last Friday.

HOUSE OF COMMONS COMMITTEE.

Tuesday, May 4.

(*Before Mr.* J. A. Campbell, *Chairman, Mr.* Baird, *Mr.* Lough, *and Mr.* Colville.)

NOTTINGHAM CORPORATION WATER BILL.

The proceedings on this Bill, which, as already stated, is to enable the Nottingham Corporation to construct additional works and extend their limits of supply, were resumed to-day.

Mr. Pope, Q.C., Mr. Pembroke Stephens, Q.C., Mr. H. Y. Stanger, Q.C., and Mr. Harold Sands represented the promoters. The following Counsel appeared for parties affected: Mr. Balfour Browne, Q.C., Mr. Lloyd, and Mr. Hugh Hole, for the Newark Corporation; Mr. Erskine Pollock, Q.C., for the Nottinghamshire County Council; Mr. Shiress-Will, Q.C., for the Corporation of Mansfield; Mr. Reader Harris, Q.C., for the Southwell Rural District Council; Mr. Toller, for the Sutton-in-Ashfield Urban District Council; Mr. Pember, Q.C., Mr. Worsley Taylor, Q.C., Mr. Freeman, Q.C., Mr. Statham, and Mr. Rickards, for landowners and riparian proprietors.

Mr. Balfour Browne announced that he had had an opportunity of reading the evidence given by Sir F. Bramwell on the previous Friday (see *ante*, p. 1065), and that he did not propose to cross-examine him.

Counsel representing other parties having made a similar statement,

Mr. Stanger said that, under these circumstances, it would not be necessary for him to re-examine Sir Frederick; and therefore the case for the promoters was closed.

Mr. Pember then addressed the Committee on behalf of Mr. F. Ley, one of the landowners affected by the Bill. He said his case referred particularly to the proposal to take water from the Woodborough and Oxton wells, which was distinct from the Boughton scheme. Mr. Ley was the owner of an estate called Epperstone Manor, the chief recommendation of which was its proximity to the Dover Beck, which was valuable for trout-fishing purposes. Some time ago, Mr. Ley was startled by the announcement of the intention of the Nottingham Corporation to sink wells at Oxton and Woodborough. The then condition of the district and the effects of the pumping upon the upper reaches of the river were perfectly well known; for the Dover Beck, in company with other streams and wells, had suffered since the commencement of pumping in the area in question. He thought there would not be much difficulty in establishing this fact. Professor Hull might say what he pleased in the witness-box; but they had his report to the Nottingham Corporation in 1894. It told a pretty good story, which was entirely confirmatory—he would not say of their view, but of their experience that the water in the Dover Beck had been diminished by pumping. Mr. Ley was naturally much alarmed by the proposals of the Corporation. There was no question whatever that, without the proposed pumping-stations being in existence, the upper reaches of the stream had disappeared altogether. Many a stream in Great Britain depended upon the overflow from the subterranean reservoir; and the whole question seemed to resolve itself into this: Tap that reservoir, exhaust that overflow, and the stream dies away. The upper reaches would be dried up; but the lower ones, where the Keuper began, would not be affected quite so seriously. Mr. Ley's estate lay in such a place that he would be deprived of the flow before the Keuper began, if the two proposed wells were sunk. It was obvious that if they were to tap and desiccate the upper reaches of the Dover Beck, there would be a mere trickle until the stream passed over sufficient area of the Keuper to recover itself. This, of course, would be too far down for Mr. Ley, who thought his fears were absolutely well based, and that if the stream was ruined by the Corporation's project, it would be fatal to the property so far as he was concerned. He (Mr. Pember) considered that the suggestion as to compensation made before the Committee was a death-bed repentance by the Corporation, who were now willing to do anything to induce the Committee to do this damage to Mr. Ley and other persons, and hoping to take the chances of arbitration. Proceeding, the learned Counsel dealt with the present needs of Nottingham, and with the contention that the quantity of water to be provided in 1920 would be 9,075,000 gallons per day. He characterized the demand for an additional supply of 6,000,000 gallons as a manufactured one, and said the Corporation could get what they wanted in the Boughton district. It was perfectly certain that if the Committee gave the Corporation Oxton and Woodborough, they would never go to Boughton, which had obviously been put into the Bill because they expected to lose the other places, and they wanted a scheme to go home with. If Nottingham was pining for water, Mr. Ley must part with his stream. But they could get their water at Boughton; and when they could not, then he could argue the question whether they ought to be allowed to get it at Oxton or Woodborough. He trusted the Committee would not run the risk of damaging such an important estate as Mr. Ley's.

The Chairman asked Counsel if he had anything to say with regard to compensation.

Mr. Pember said he had stated that he wanted no compensation—he repudiated it altogether. He stood upon Mr. Ley's rights as a landowner, and said that compensation was not his case.

Mr. *F. Ley* was then called. He said the Dover Beck flowed at the bottom of his estate; and he had spent £700 in making it a good trout stream. In 1893, he laid out some £12,000 in improving and decorating the mansion; and, in his judgment, the property would, if the Dover Beck were spoilt as a trout stream, be depreciated to the extent of £8000 or £10,000. If the stream went, he went; and no money would compensate him for the loss of it. He had observed a number of springs bubbling up into the stream and feeding it.

In cross-examination by Mr. Pembroke Stephens, witness repeated that if the fish went he went. At the time he went to the estate, four years ago, he had not the slightest idea that the stream was affected by the pumping. Supposing there was damage, and it could be proved, he did not want compensation. If the Corporation could give him the sporting rights he had now, he had no wish to stand in their way. If there was no damage resulting from the pumping, he was quite satisfied. On the other hand, if damage was done to the stream he should leave Epperstone Manor.

Rev. *T. W. Smith*, Vicar of Calverton, stated that when in 1880 the Hucknall well was sunk, the well on his glebe farm began to become dry; and it was a matter of common knowledge that after the first big well was made in 1876, the small ones at Calverton began to go dry, and had to be deepened. The wells so affected were about half a mile from the Hucknall well. As soon as the borehole at Woodborough was sunk, the well at the Calverton Vicarage was affected; and when the hole was stopped up, the water came back. During the 23 years witness had been in the parish, he had noticed that the Dover Beck had been gradually decreasing.

Other witnesses were called to prove that the quantity of water in the streams and wells in the district had decreased considerably during recent years.

Wednesday, May 5.

Mr. *J. L. Francklin*, a landowner, was called in support of his own case, and described the character of his estate. He said if the Bill were passed, his estate would be ruined agriculturally, for the reason that it was dependent upon the valley land, without which the farms could not be let. These valley lands were, of course, washed by the Dover Beck and other small streams. With regard to the use of the stream for fishing purposes, he had valuable fishing rights; and for one stream alone he had been offered £100 a year. The Dover Beck was one of the finest trout streams in the country; and great complaints had been made with regard to its gradual disappearance. He had seriously considered the proposals of the Bill; and he was convinced that to sink the suggested wells would mean ruin to himself and his poor neighbours. They could not afford to come there, nor could he.

In cross-examination, witness said the feeling generally in the district was opposed to the Nottingham scheme. The Parish Councils of Calverton and Woodborough had, however, passed resolutions in favour of it. He did not know that the Parish Council of Oxton had passed a similar resolution; nor was he aware that the resolution of the Calverton Council was confirmed by a parish meeting.

Mr. *H. Rofe*, M.Inst.C.E., was next called on behalf of Mr. Ley and Mr. Francklin, and explained the character of the area in question. Taking the average rainfall at 26 inches per annum, he estimated that the available supply of water was 9,500,000 gallons a day. Of this 6,750,000 gallons a day were now pumped. The area comprised 31 square miles, and included the Basford pumping-station. With this exception, his area agreed with that of Professor Hull. He had prepared tables which showed the observed flow of the Dover Beck at a gauge fixed at the point where the stream entered Mr. Ley's property. The average daily flow, except in December, varied between 3 and 4 million gallons. The records were made by an automatic gauge; and they showed conclusively, in his opinion, that the reduction in the flow of the Dover Beck was not on account of a diminished rainfall. Witness did not think any suggested limitation of the amount of water to be taken at Woodborough and Oxton would meet the case. At the present time there were springs of water bubbling up into the stream itself. The water was forced up. But if the saturation-level was lowered, this pressure would be absent; and if there was any water in the stream, it was flowing down the fissures through which the water had previously bubbled—in fact, it would be like a stream flowing over a sieve. Witness produced a diagram exhibiting the effect of pumping, and showing how various cones of exhaustion would be created. He thought Mr. Francklin's fears were well grounded. In his opinion, if the proposed wells were sunk, great injury would be done to that gentleman's estate, and the Dover Beck would cease to exist. Having regard to the ordinary practice, it was an unreasonable and cruel thing to put down a well at Woodborough or at Oxton, when so much water could be procured at Boughton.

In cross-examination, witness said the whole of the supposed diminution of the stream was based upon the gaugings made by Mr. Hawksley

in 1868; but he would not believe Mr. Hawksley ever went before Parliament with casual gaugings. Mr. Ley's estate was a beautiful place now; and there were water meadows on Mr. Francklin's estate. If wells were sunk, he anticipated that damage would be done; and he firmly believed that the proposals of the Corporation would have the effect of abstracting water both from the Dover Deck and Farnsfield. Putting Boughton out of consideration, if he had been asked to suggest a proper place for Nottingham to go to for its water supply, he should have said the upper waters of the Derwent, and not anywhere in the district now under consideration.

Professor *Boyd Dawkins, F.R.S.*, who had been called on the Newark Bill, said he had heard the whole of the evidence given, and also the suggestion that, though the Dover Beck had diminished, it was not due to pumping. He thought this was absolutely unfounded. On the contrary, he believed it was quite conclusive that artificial means had interfered with the Dover Beck. In his opinion, the Woodborough well would affect the stream, and do far more mischief than the one at Oxton. However much the stream might be protected when it flowed over the Keuper, it was his opinion that the water would be abstracted before it reached that point. With regard to the disappearance of the stream in 1869, he knew of no natural cause; but he attached considerable importance to the sinking of the collieries in the area—in fact, he connected the disappearance of the stream with the sinking of the wells. He had studied the tables of rainfall, and the evidence was certainly not sufficient to account for the diminution which took place in the years 1869 and 1889. He attributed the second disappearance of the stream in 1889 to the putting down of more pumps and to excessive pumping. He had examined the estate of Mr. Francklin very carefully; and if the proposed scheme was carried out, it must injure the property. The scheme, in fact, was a most dangerous one, and one which ought not to be taken in hand unless there was some pressing necessity. Referring to Boughton, witness said there was an enormous water-bearing area there which would be available for Nottingham.

Cross-examined by Mr. PEMBROKE STEPHENS, witness said that, under existing conditions at Boughton, he was not aware of any possible competition. When he made his report to the Nottinghamshire County Council, he said it was not advisable for the Corporation to go to the Boughton district, for the reason that there might be coal workings in the neighbourhood. His alternative scheme was the upper waters of the Derwent.

In answer to Mr. FREEMAN, witness said the Derwent scheme was best of all; but if the Corporation would not go to the Derwent, it would be better for them to go to Boughton than to Oxton or Woodborough. He did not think that, with regard to the landowners, compensation would meet the case; and an arbitration as to damage done would involve a very long and costly inquiry.

Thursday, May 6.

Mr. *J. Mansergh*, M.Inst.C.E., was recalled this morning. He said that, having heard all the evidence given with respect to the Bill, he had no reason to change the view he held when he was witness for the Newark Bill. On the contrary, he was more confirmed in his opinion that the proposals of Nottingham would have the effect of desiccating the Dover Beck areas. Questioned with regard to the flow of this stream, he said Mr. Hawksley's gauge was a minimum one, and no one doubted the accuracy of it. Mr. Rofe's recent gaugings showed that, from some cause or other, the stream had dropped by one-half since 1869. He had no doubt about the cause. In his opinion, the production by Mr. Rofe of the tables as to rainfall had strengthened the case. He thought it was not possible to account for the diminution of the stream by any reduced rainfall; and having this experience in his mind, he concluded that if the Oxton and Woodborough wells were sunk it would only be a question of time for the Dover Beck to be dried. Supposing this depletion took place, it would inflict irreparable damage on the two estates in question. Witness did not agree with the suggestion that, when the water was tubbed off at the well, the surface waters in the neighbourhood would be unaffected. The existence of an outflow for the underground water in the district in question was unknown. Referring to the question as to whether or not Mr. Hawksley's gauging was of the minimum flow, witness produced a record of gaugings at Tunbridge Wells, showing that the contention that that eminent engineer's gauging was entirely favourable to the opposition was correct. Proceeding, he described an analogous case where a company sought to obtain water from the red sandstone, and where the landowners opposed. The Committee who considered the matter rejected the Bill. Witness was in opposition at the time, and he suggested that the surface waters should be impounded. In the following session, the company came forward with a Bill embodying the suggestion; and it was passed. To his mind, that case was on all-fours with the present one.

In cross-examination by Mr. PEMBROKE STEPHENS, witness said that though Mr. Hawksley was content with one gauging in order to ascertain the minimum flow, Mr. Rofe was quite justified in taking gaugings for fifteen months. The Oxton Beck was upon the Keuper. He put it that 3 million gallons had disappeared from the stream; and the disappearance had been gradual. He could not say what the period was; but the depletion was going on. Supposing they could arrest the water which was now going underground to the sea, it would certainly do good to a great many people. It was quite possible to tub out the surface waters; but it would be a costly process.

Mr. H. R. THORPE then addressed the Committee in support of a joint petition which had been presented by Mr. Roby Thorpe and himself in respect of the ownership of some meadow lands, which he said were adjacent to, and in a great measure actually abutting upon, the Dover Beck. This meadow land contained some 60 acres; and he purchased his portion of it some few years ago, chiefly because it abutted upon the Dover Beck. His case was that there was no necessity for the Corporation to acquire dominion over the stream. Moreover, an additional supply of water was procurable from the Boughton well.

Mr. SHIRESS-WILL next spoke in support of the case for Mansfield. He said if the Corporation obtained their scheme, the supply, with the addition proposed, would give 40 gallons per head per day. This was a most outrageous demand. According to Mr. Hill's evidence, they would have one well at rest; and, notwithstanding that, they would have 1½ million gallons of water to spare each day at the end of fifteen years. Mr. Hill put the matter most fairly. If they took the requirement to be 25 gallons per head per day, they would only want 8¾ millions at the end of that time. The present available supply was 6 millions; so that all that was wanted was 2¾ millions. If he could bring this home to the Committee, it was obvious that the whole difference the Bill ought to provide for was 2¾ millions. Supposing Nottingham sank a well at Boughton, and obtained 3 million gallons a day, which was an addition of 10½ gallons per day on the present population of 280,000, this showed what a valuable addition it was; and it would practically give the Corporation fifteen years in which to turn round. The case, therefore, came down to this—that Nottingham only required in fifteen years' time an additional supply of 2¾ millions; and this quantity could be obtained at Boughton.

Mr. FREEMAN followed on behalf of Mr. Francklin; urging that, as the Corporation could get all they wanted at Boughton, it would be cruel to go on with the Oxton and Woodborough wells, and inflict injury which was perfectly avoidable.

Mr. *J. E. Ellis*, M.P., was next called for Hucknall Torkard. He stated that, in his opinion, nothing could be more dangerous than the establishment of the wells at Oxton and Woodborough; and it was reasonable that Parliament should protect the wells which they had, so to speak, brought into existence.

Mr. *W. Swan*, the Superintendent of the Hucknall Water-Works, said that when he was appointed in 1883 the rest-level of the water was 59 feet, at which it remained until 1886. Pumping was going on at Papplewick at this time. In January, 1887, he found that the rest-level was permanently reduced by 11 feet. There had been periodical reductions of the level since then, at an average of 2 feet per year; 27 feet having been lost since their well was opened. They were now pumping about 208,000 gallons a day; and there was no difficulty in getting it.

Friday, May 7.

Mr. *F. Whyatt*, the Chairman of the Water Committee of the Hucknall Torkard District Council, was called to give further evidence in support of the Hucknall Torkard case. He said he remembered the contest in 1878 between the Nottingham Water Company and Hucknall Torkard, and the scheme brought forward by Hucknall. As far as he could recollect, the question of a water supply was broached in 1875. The town was first provided with water from the new well in 1881; and the inhabitants had been perfectly satisfied since then with their supply. The feeling had been very strong against the proposals of the Nottingham Corporation; and this feeling was aggravated by the statement in the Nottingham Town Council that the desire was to secure wells in order that they might not be compelled to go farther afield. The Hucknall Torkard people desired to offer most strenuous opposition to the Bill. Witness went on to describe how the level of the Hucknall well had been lowered since the Papplewick well was sunk. The population was an increasing one; and at the present time from 85 to 90 per cent. of the houses were under £10 rateable value.

Cross-examined by Mr. PEMBROKE STEPHENS, witness said the fact that they sank their well as the result of an agreement with a landowner, was perfectly satisfactory to Hucknall. They were, however, not satisfied with the effect the Papplewick well was having upon their well. He admitted that after the first great reduction in the water-level at the Hucknall well, the water rose a little; but there was a permanent fall of 11 feet. Though there might have been a sinking in the Hucknall well, there was plenty of water after they had deepened the well.

Mr. *Radford* was then called, and was proceeding to give evidence on behalf of Hucknall, when

The CHAIRMAN said he thought it might shorten the proceedings if he stated that, as regarded the evidence against the Oxton and Woodborough wells, the Committee felt they had heard enough already. He did not, however, wish to prevent Counsel from saying anything which might strengthen his case; but the Committee felt they could dispense with further evidence against the wells.

Mr. FITZGERALD observed, in reply, that the evidence given had been in connection with the Dover Beck; and what he proposed to do was to call witnesses to speak as to the effect upon the Hucknall well. If, however, the Committee did not care to hear this evidence, he would, of course, close his case at once.

The CHAIRMAN: Our feeling is that you may close your case.

Mr. FITZGERALD, addressing the Committee, said it would be a matter of grave importance to the people of Hucknall if Parliament sanctioned the proposals of Nottingham. The only question was whether the Committee were satisfied that the proposed wells at Oxton and Woodborough would injuriously affect existing wells. The learned Counsel laid stress on the statement that there was at Boughton sufficient water for all the wants of Nottingham; and when they had such a district to go to, he asked the Committee not to allow the Corporation to inflict overwhelming injury upon the local authorities. So far as these authorities were concerned, no compensation was suggested; and, indeed, any suggestion as to compensation was absurd.

Mr. READER HARRIS next addressed the Committee on behalf of the Southwell Rural District Council; announcing that, though he had many witnesses, he would refrain from calling them after the intimation of the Committee. If the Oxton and Woodborough wells were not sanctioned, practically the Newark Bill became unnecessary. But with regard to the Nottingham proposal, there were very many fears in the district as to the effect of the pumping upon the farms and the adjoining parishes. In case the Committee allowed the Boughton well, he asked that the Nottingham Corporation should be compelled to supply in bulk, and that clauses should also be included in the Bill preventing them from breaking up the roads without due notice.

The Committee were then addressed by various Counsel representing the millowners, the Sutton-in-Ashfield Urban District Council, and the Nottinghamshire County Council; their general contention being that the needs of Nottingham could be satisfied without sanctioning the Oxton and Woodborough schemes.

The Committee then adjourned till the following Tuesday.

Tuesday, May 11.

On the resumption of the proceedings to-day,

Mr. POPE addressed the Committee in support of the Bill; his argument being directed to the following points: What water Nottingham

required; what water was obtainable; and what share of it Nottingham could have without detriment to others. Having dealt with each of these points in detail, the learned Counsel concluded by saying that Nottingham asked for nothing but what was equitable and fair. They could have a share of the water which was at their own door without doing injury to anybody. Nottingham claimed what he might call the paramount power in the county—not the right to oppress or injure its neighbours, but the right to supply its wants from the sources it had at hand. If there was water, then the reasonable and fair course for Parliament to take was to let Nottingham have its share, and leave them to go farther afield when that share had been exhausted. If the Oxton well did not meet the approval of the Committee, then the reason for the Newark Bill had gone; for that Bill was founded on the ground that the Oxton scheme would damage the Newark well. He asked the Committee to say that the proposal of Newark was unreasonable and unprecedented. He quite admitted that Newark would be entitled to a protective zone if they obtained it by paying for it; but the vice of the Newark Bill was that the promoters came to Parliament and proposed to take the land without compensating the owners. He protested that it would be treating a large community with injustice if, for the purpose of securing rights which were already secured, and of protecting that which they were willing to pay compensation for, they deprived Nottingham of so to speak what was their inherent right—namely, the water which was under their own soil. In conclusion, the learned Counsel submitted that the proposition of Nottingham was a reasonable one; and he asked the Committee to pass the preamble of the Bill.

Mr. Balfour Browne then replied on behalf of the Newark Corporation. He said the Newark Bill simply asked for protection on behalf of the Farnsfield well. His learned friend had twitted him with the statement that the proposal was unprecedented; but he thought his best answer was the action of the Committee with regard to Oxton and Woodborough. This, however, was not sufficient protection. What had Newark done with the permission of Parliament? They had spent £60,000 on their water scheme; and they desired to safeguard their well. Nottingham claimed the right to sink a well within their limits; and though the Committee rejected Oxton and Woodborough, the Corporation could, if they obtained the permission of the Local Government Board to raise the money, sink a well at Oxton. Therefore he contended that Newark was entitled to protection. If the Committee granted Newark the limits proposed, they would prevent Lord Savile from selling water out of the district, and would also protect the Southwell district. It had been said it was a stupid argument—that in this area there were 41 square miles. But there were only 15 miles of pebble beds; and the amount actually protected was only 4 or 5 miles. All Newark had to draw upon would be these 4 or 5 miles of pebble beds; and he said this was not too much. If the Committee limited them to 2 miles, they did not protect them from Oxton. In conclusion, Counsel said that if the Committee cut the radius down to 2 miles, he would ask them to protect the present limits of supply. He had thought that, to be perfectly fair, Newark should supply the districts within the proposed limits. This was, however, he admitted, the secondary object of the Bill; the main object being to obtain protection.

The room was then cleared. On the re-admission of the parties,

The Chairman said: The Committee have considered the evidence submitted to them, and have now to declare the preambles of both Bills passed, with limitations. With regard to the Newark Bill, we are willing to grant protection within the existing limits of supply; and with regard to the Nottingham Bill, we grant the pumping-station at Boughton.

In reply to Mr. Stanger, the Chairman said the proposed added limits to the Nottingham area fell with the Oxton and Woodborough wells.

After some discussion, the Committee adjourned until the following day, in order to give the various parties an opportunity of preparing clauses in accordance with the decision come to.

St. Neot's Water Bill.

This Bill, which was promoted with the object of obtaining powers of incorporation for a Company formed to construct works and supply water in the parishes of St. Neot's and Eynesbury, in Huntingdonshire, and of repealing the powers granted to the East Huntingdonshire Water Company with regard to the supply within certain limits prescribed, recently came before a Select Committee of the House of Commons presided over by Colonel Gunter. Special interest attaches to this Bill, which was passed by the Committee on the 13th inst., inasmuch as it will form a notable precedent. A curious feature of the proceedings was that the promoters went to Parliament with practically no support from the district. The evidence they submitted for the consideration of the Committee, however, showed that the local authorities—first the Local Board and afterwards the District Council—had so persistently shelved the question of providing an adequate supply of water for the area under their control, in spite of urgent letters addressed to them by the Local Government Board, that the Committee considered themselves perfectly justified in transferring their powers to private individuals, at the same time limiting the Council's option to purchase the undertaking, under the Bill, to a period of two years after the completion of the works. A report of the proceedings before the Committee will appear when our columns are less crowded than they are at present. In the meantime, the circumstances under which the Bill was promoted and the result arrived at are so exceptional, that they should be briefly placed on record.

The Situation of the Nitrate Industry.—"It is evident," says the "Financial News," "that the situation of the nitrate industry is rapidly becoming critical; for, though no decision as to the maximum total shipments during the year from April 1, 1897, to March 31, 1898, has yet been announced by the Producers' Committee, Mr. Thomson Aikman states in his circular that 'to prevent a continued depression in values, it is now generally considered imperative that a reduction in the minimum figure of 23,500,000 quintals should be made, owing to the retrogressive consumption this season probably leaving a heavier surplus than expected.' This opens up a serious vista for most of the English-producing companies, which are already in a sufficiently bad way."

LEGAL INTELLIGENCE.

NORTHERN DIVISION POLICE COURT, DUBLIN.—Tuesday, May 18.

(*Before Mr.* Keys.)

Cutting Off the Supply of Gas to a Bankrupt's Premises in the Possession of an Official Assignee.

His Worship to-day delivered judgment in an interesting action against the Alliance and Dublin Consumers' Gas Company. It was brought by Mr. Alexander Knox M'Entire, the Official Assignee of the Court of Bankruptcy of the estate of Charles Percy Brett, of 5, Bachelor Walk, a bankrupt, for that the defendants did on the 8th of April and following days discontinue the supply of gas to the premises, 5, Bachelor Walk, and having at the time of such discontinuance a supply of gas therefor, thus rendering them liable to pay to the assignee a penalty of £5 per day for every day of such discontinuance. The facts will be found set forth in the judgment.

Mr. Ignatius O'Brien appeared for the Official Assignee; Mr. R. H. Shiel for the Company.

Mr. Keys, in delivering his decision, said the prosecution was an important one, not only as regarded its own merits, but in respect to the procedure in similar cases in future. The complainant being the occupier of the bankrupt's premises claimed for the penalty under section 49 of the Alliance and Dublin Consumers' Act of 1866. The question of security embraced in the section did not arise in this case, as it was not in fact at all demanded. The circumstances were: On Feb. 26 the bankrupt, trading as Twigg and Brett, wine merchants, was adjudged bankrupt; and on March 5 complainant was declared by the Court to be at liberty to carry on the business. He installed Mr. John Gardiner, his assistant, in the premises; and on March 13 this man informed the gas-meter inspector who called at 5, Bachelor Walk that the Official Assignee of the Court of Bankruptcy was in possession, and would pay in full for all gas consumed since the adjudication of Mr. Brett as a bankrupt. On April 2 a final notice addressed to Twigg and Brett was received at Bachelor Walk requiring payment of the account up to March—viz., £5 15s. 9d., and threatening, if payment were not made, that the gas supply would be discontinued. Mr. M'Entire wrote informing the defendant Company that, by order of the Court he was carrying on the business, and requesting a supply of gas as heretofore. The defendant Company declined to comply with the request; and on April 8 they cut off the gas. Although then requested to give a new supply, they refused to do so, and discontinued it up to the date of the hearing of the summons, causing thereby loss to the persons employed in the premises, the bankrupt's creditors, and the stock. In his opinion, the whole case turned on the point, was Mr. M'Entire in occupation of the premises quite distinct from the bankrupt, or was his merely a continuance of the former occupancy. If he were not a person other than the former occupier, then the defendants had certainly a right to cut off the supply; but if he were a new occupier, then he was a person having a supply of gas, and as such would be entitled to have the supply continued to the premises. He (Mr. Keys) conceived an Official Assignee to be a person in whom the estate was vested for the benefit of the creditors of the bankrupt, and not for the benefit of the absconding bankrupt. How then could Mr. M'Entire be identified with the bankrupt when he represented the interests of people who were altogether a different entity? He was of opinion that Mr. M'Entire's occupancy of the premises was a new one. The intimation given by Mr. Gardiner he should consider as having been given to the defendant Company, though it was sworn that the meter inspector did not report that intimation at their office. The Company supplied Mr. M'Entire with gas after one of their officials had received notice that the complainant was carrying on the business. He, therefore, considered Mr. M'Entire was a person having a supply of gas on the premises at the time of the discontinuance; and the cutting off of the gas being a breach, in his opinion, of the 49th section of the Act, he directed that the Company should pay complainant £17, being at the rate of £1 per day from April 8 up to the time of the issue of the summons. He also gave five guineas costs.

Mr. Shiel applied for a case to be stated; and it was granted.

READING COUNTY COURT.—Friday, May 14.

(*Before His Honour Judge* Lushington.)

Claim by a Gas Worker against the Wokingham Corporation—An Unfenced Gas-Engine.

In this case, John White sought to recover from the Wokingham Corporation £200 damages for personal injuries sustained by him while in their employ. The claim was made under the Employers' Liability Act; it being alleged that the injuries were caused by a gas-engine which was defective through negligence, and also that it was unfenced.

Mr. Percy St. Gerrans appeared for the plaintiff; Mr. A. H. Spokes for the Corporation.

Mr. St. Gerrans, in opening the case, stated that the plaintiff worked the engine for several months. On the afternoon of Sunday, Jan. 24, he found some difficulty in starting the engine when he returned from tea; and while attempting to see if the gas had gone out, he slipped, his left foot being caught by the crank, and his little toe cut off. At the time he was standing on the nut by means of which the engine was fixed, in order to get a greater elevation to see the condition of the ignition-tube. A person standing on the ground could not see that; and there was nothing to prevent the foot coming into contact with the revolving crank. One of the defects upon which the plaintiff relied was the imperfect condition of the ignition-tube, inasmuch as the asbestos inside the cylinder was displaced, through the negligence of the defendants. There was also an infringement of the Factory Act through the machinery not being fenced.

Dr. *Ward* spoke to plaintiff's injury being a permanent one.

Plaintiff stated that the engineer who fixed the engine described to him the way it worked, and stepped upon the nut exactly as he did, and

looked over into the cylinder. That was the only method by which plaintiff could examine the ignition-tube. As a result of the accident, he was laid up for ten weeks. He was under notice to leave at the time; but he did not know the reason. He had complained to the Corporation of the engine being unfenced, and told the Manager about it.

Mr. SPOKES contended that the nut, or the piece of iron, which was 16 inches from the floor, formed a guard to the crank itself. He held that there was no need for plaintiff to have stepped on the nut, nor to have looked into the cylinder, because if the engine was working that was evidence that the gas was alight.

Mr. *Henry Lewis* gave evidence to the effect that, from his experience, the engine was properly guarded. The pit or tank in which the crank worked formed a guard of itself. There was no need to look over the cylinder to see the condition of the ignition-tube.

Mr. *E. Margetts* said he regarded the nut as a trap rather than as a protection to the crank. It would have been safer to have had no guard there at all. He considered it right to look down the tube; but nobody ought to look down until the engine was stopped.

Mr. *C. E. Kent* stated that a large number of Messrs. Waller and Co.'s engines (of which this was one) had been made under his personal supervision. He had never heard it suggested until that day that a guard was requisite in this particular make. It was unnecessary for the man to get upon the nut at all. He should have looked through the air-holes at the bottom of the tube. A moveable guard would be dangerous on an engine of this description. The nut was not intended to stand upon.

Mr. *G. T. Phillips*, the Mayor, denied that the plaintiff ever made any complaint to him respecting the engine.

His HONOUR said he could not excuse the Mayor from responsibility of noticing causes of danger perfectly obvious to any careful eye.

Evidence was also given by other members of the Corporation and employees to show that the engine was not defective, and that it had never been suggested that a guard to the crank was necessary.

His HONOUR held that there was negligence on the part of the defendants in not fencing the crank; and this was the cause of the accident. He also differed from the defendants' statement that the condition of the burner could have been ascertained in any other way than that adopted by plaintiff. He gave judgment for the plaintiff for £50, and costs on the high scale.

The Incandescent Gas-Light Company's Patents.

In the Chancery Division of the High Court of Justice last Saturday, Mr. Justice Romer had before him the case of *The Incandescent Gas-Light Company, Limited, v. Reimer*, which came on as a short cause upon motion for judgment in default of defence. The plaintiffs asked for an injunction restraining infringement of their patents of 1885 and 1886. Evidence of various acts of infringements having been given, his Lordship made the order as prayed, and certified that the particulars of breaches were proper. An order was also made against Messrs. Lloyd and Co., for infringing the same patents. In an action brought by the Company against a Mr. Young, who was charged with infringing the patents of 1885, 1886, and 1893, his Lordship made a similar order.

Liability of Mortgagees for Water-Rates.

At the Sunderland Police Court, on the 12th inst., Messrs. W. and J. E. Harrison were summoned by the Sunderland and South Shields Water Company for arrears amounting to £1 5s. 6d. in respect of certain properties of which they are the mortgagees. Mr. Bell appeared on behalf of the Company; and Mr. Dobinson defended. The proceedings were taken under the Water Companies (Regulation of Powers) Act, 1887. It appeared that when Messrs. Harrison came into possession of the properties on the 8th of March, arrears to the above-named amount were standing for the quarter from Nov. 23 to Feb. 14. Mr. Dobinson submitted that the mortgagees were not responsible for the arrears; but Mr. Bell cited the case of *The East London Water-Works Company v. Kellerman*, decided by Justices Day and Charles on May 9, 1892, and reported in the "JOURNAL" at the time, in which it was held that the owner, and not the occupier, was responsible for the rates where the rent was under £20. The Bench made the order for payment against Messrs. Harrison.

Robbing a Prepayment Meter at Cleethorpes.

A lad described as an incorrigible, but who bears the highly respected names of Daniel Elias Christopher Thomas, was charged at the Grimsby Police Court yesterday week with stealing 6s. 5d. from a prepayment meter, the property of the Cleethorpes Gas Company. The boy was at the house of a Mrs. Churchayes on the 8th inst., playing with her children; and while there, he prised open the meter and took out the money, which he spent in festivity. The lad has been convicted twice previously of felony; and the Bench sentenced him to ten days' imprisonment, and five years in a reformatory school.

Heavy Fine for Stealing Water at Birmingham.

Edward C. Parsons, a shop assistant, was summoned a few days since, before Sir Walter Foster and Mr. W. N. Fisher at the Birmingham City Police Court, for having unlawfully taken a gallon of water from a pipe. Inspector Barnham, of the Water Department, deposed that on the 5th inst. he saw defendant, who was employed by Mr. Richards, a fruiterer, of New Street, fill a can with water from a tap at the rear of neighbouring premises. He spoke to him about it, and defendant said he wanted the water for some plants. Witness explained that the supply to his master's premises was cut off at Lady-day by request of Mr. Richards. Defendant said he did not know he was doing wrong in filling a can with water. It was the first time he had done so; and on that occasion he wanted to water some plants. Sir James Sawyer asked whether there was any sanitary accommodation on the premises. Defendant said that there was; but it was not used, and therefore no water was required. Mr. Fisher thought that in a fruiterer's business a good supply of water would be required; but defendant said it was not so. The Bench considered the case a serious one, and imposed the maximum penalty of £5 and costs.

MISCELLANEOUS NEWS.

THE FATAL GAS EXPLOSION IN BOSTON (U.S.A.).

The Boston Gas Company Responsible.

In the "JOURNAL" for the 23rd of March (*ante*, p. 674), we gave from a Boston paper some particulars of the serious gas explosion which occurred in that city a short time previously, and which resulted in six deaths, and injuries to about forty people. One of the victims was the Rev. W. A. Start, a Professor at Tufts College; and, in accordance with the Public Statutes of the Commonwealth, an inquiry was instituted into the cause and manner of his death. It was conducted by Judge Ely, of the Municipal Court, and lasted, with intervals, from March 12 till April 2. On the 24th of the latter month, Judge Ely issued his report, in which he placed upon the Boston Gas Company the responsibility for the fatality. The document occupies several columns of a local paper; but the following abstract embraces the principal points.

The explosion occurred at about a quarter before twelve; and the place was near the northerly terminus of section 4 of the Boston subway. This section, which was then nearly finished, was built under contract by the Metropolitan Construction Company. One part was what is called "single-barrel" work—*i.e.*, one arch covering two tracks—another part, double-barrel work. At the place of the explosion, there were two tracks and two barrels. The westerly barrel was called the low barrel; and at this place its bottom was 38 feet below the surface of the street. The easterly one was called the high barrel; and its bottom was about 22 feet beneath the surface. At the same place, the top of the low barrel was about 20 feet below, and the top of the high one about 4 feet below the street. The distance between the two barrels at the place of explosion was about 10 feet. In constructing the low as well as the high barrel, a trench was excavated. At the time of the explosion, the low barrel had been completed, and the trench filled with earth to a height nearly equal to the top of the high barrel. Above this filling, and above the top of the high barrel, was a vacant space, covered by planks, which formed the surface of the street. The total area of this planked surface was 2250 square feet. The depth from the surface to the filling and the top of the high barrel averaged 5 feet; but just at the point where the explosion occurred it was about 9 feet. At the time the Construction Company began to build section 4, and during the building of both barrels, there were in Tremont Street and Boylston Street (crossing at right angles), and crossing each other, the following pipes: In Tremont Street, one 3-inch and one 2½-inch Edison electric, one 8-inch and one 12-inch water, one 24-inch Bay State gas, one 12-inch Boston gas, and one 30-inch water. In Boylston Street, two 2-inch and one 3-inch Edison electric, one 6-inch Boston gas, one 3-inch water, one 6-inch Bay State gas, four 3-inch Edison electric, and one 8-inch Boston gas; and running round a corner, one 10-inch Bay State gas. All these pipes were uncovered by the excavation for the subway, and required supports during its construction. On the surface of both Tremont Street and Boylston Street were double street railway tracks running directly across each other, and also round each of the four corners of the two streets, where stood the Masonic Temple, the Hotel La Touraine, the Hotel Pelham, and the Common. On these tracks street-cars were constantly passing, in such numbers as to interfere with each other; and many carriages and teams were crossing continually. So that at this place the traffic was more congested than in any other part of the city.

According to the contract entered into between the Boston Transit Commission and the Construction Company, the contractor for the section of the subway in question was, by means of suitable supports and bridging, to maintain the surface of the street and the railway tracks in an entirely safe condition for their usual service, from 7 a.m. to 7 p.m. in Tremont Street; and in Boylston and Eliot Streets at all times, except between 10·30 p.m. and 6 a.m. The contract was made in March, 1896. The work under it was begun in Tremont Street; and the westerly (low) barrel was completed in the early part of December—work being begun on the easterly (high) barrel on Nov. 30. At the time of the explosion, the high barrel was nearly completed. The arch was entirely closed in, and only a little outside covering of it remained to be done. The subway was not injured by the explosion, with the exception of a few outside tiles broken. There was, as already stated, an extensive vacant space covered by the plank surface of the street; and in this space the gas which caused the explosion accumulated and was confined. The explosion was followed by a fire of brief duration, which was easily extinguished. As soon as possible men entered the vacant space and found that the 8-inch main of the Boston Gas Company was fractured completely round in one place, and that the 6-inch main of the Company was fractured completely round in two places. Afterwards a third fracture was found in the 6-inch pipe. These two mains ran through Boylston Street, crossing Tremont Street; the 8-inch main running in about the centre of Boylston Street, and about 15 feet north of the 6-inch main. The only mains that had gas in them at the time of the explosion were the mains that were broken and the 10-inch main running down Tremont Street. As early as 25 minutes to 1 o'clock, after the explosion, the gates round the crossing of Tremont and Boylston Streets were closed, and all gas shut off except that in the 10-inch main. All four breaks were under, or nearly under, different rails of the street tracks; and the break in the 8-inch pipe was directly above the deepest part of the excavation, and beneath the southerly rail of the outward track. At the time of the explosion, a car was directly over the place where this break was found.

These two broken gas-mains had been in the ground and in use for 35 or possibly 40 years. They were cast horizontally, with the usual result of being of uneven thickness; the lowest part of the casting, as it lay in the mould, being the thickest part, and the casting gradually diminishing till it became thinnest at the highest part. At the first break in the 6-inch main, the iron was only ⅛ inch thick at the thinnest part. Originally it had been about ¼ inch thick; but, either by reason of an old break, extending partly through the pipe, or from some other cause, the pipe had rusted half way through. At the same po'nt where this pipe was weakest, and where the break occurred, there was also a defect

in the casting, which soon after the explosion ran entirely through the pipe. This was either a blow-hole or a defect caused by a little sand getting into the casting. The break was about 2 feet away from a cement joint. This pipe at its thickest part was 9-16ths of an inch.

The standard thickness of pipes used at the present time is ½ inch; and the variation in thickness is not allowed to be more than 1-16th of an inch. This pipe at the joint of the break rested in the filling of earth on the westerly barrel. The second or middle break in the 6-inch main was 21½ inches from a joint, and was nearly under the same rail of the street track which was above the break in the 6-inch main. The pipe at this break was ½ inch thick in the thinnest part, and somewhat rusty; but it had no defect in it like that at the first break.

The third break in the 6-inch main was at the shoulder of a bell joint. It was an old-fashioned casting which broke; and the break appeared to be clean and fresh. The fracture in the 8-inch pipe was at the shoulder of a cement bell joint. It was clean and fresh. The pipe at this joint was thin; being ¼ inch thick at the thinnest part. The joints in these pipes were cement, and not lead; and these, owing to their perfect rigidity, rendered the weak pipes more liable to fracture. The 6-inch main was 3 ft. 2 in., the 8-inch main 4 feet, below the surface of the street. Other gas and water pipes in this covered space equally exposed to the force of the explosion were practically uninjured.

During the whole time that excavations for the subway exposed gas-mains, the presence of escaped gas was perceptible in streets and buildings near. Gas was smelt in the Masonic Temple and at the crossing for foot passengers about nine o'clock on the morning of the accident; and by eleven it became so bad as to cause a policeman on duty to telephone to the Boston Gas Company's office on the matter. The message was received shortly after eleven o'clock; but there was no jobber on the premises just then; and it was twenty minutes to twelve before a man was dispatched. On his way to the scene, he heard the explosion.

It appears that, many months before the contract for building section 4 of the subway was made, the question of who should bear the cost of re-locating gas-pipes was discussed between the Boston Transit Commission and the Boston Gas Company. As early as Sept. 10, 1895, the Commission ordered the Company to re-locate their pipes crossing the subway. The Company replied that they would comply with the order, provided the Commission would "agree to pay the actual cost of the work and material necessary for such compliance." As often thereafter as it became necessary to alter the positions of gas-pipes, the same contention was repeated; and the question has not yet been decided. But, to facilitate the work, it was understood by both parties that, without waiving any rights of either, the Commission should make contracts with one Farrington, who had been connected with the Company for twenty years, and was the Superintendent of the Street Department, to re-locate all gas-pipes, and leave the question in dispute to be subsequently determined. Accordingly, contracts were made under which Farrington re-located gas-pipes, including the 6-inch and 8-inch mains which were broken at the time of the explosion. The work was done in November, 1895; and Judge Ely found that it had been well and properly done. Under the contract which the Transit Commission made with the Construction Company, the latter were obliged to support not only the bridge of planks forming the surface of the street so that it would be safe for all kinds of street traffic, including cars, but also the numerous pipes already mentioned.

The Chief Engineer of the Transit Commission (Mr. H. A. Carson) was asked by the Judge, in the course of the inquiry, if he had ever known a case where such a structure as the subway in question, or anything like it, was erected in a congested intersection of two streets like that of Tremont and Boylston Streets, and gas-pipes maintained beneath the surface with gas going through them and the traffic of electric cars and teams and all sorts of carriages allowed to pass on the service at the same time; and he replied that he had not. But he reminded the Judge of the existence of the law requiring the traffic to be maintained from eight in the morning till six at night. This was part of the subway law; but it said nothing about gas-pipes. This testimony was confirmed; and the Judge said he thought the Transit Commission had imposed upon the prosecution of the work dangers to the public safety unprecedented in any similar undertaking, and such as the statute intended to guard against, although it was undoubtedly within the discretion of the Commission to make the contract they did. Though there was no direct evidence of the origin of the explosion, Judge Ely thought it could not be doubted that it was caused by an electric car moving over the planked surface and igniting the gas beneath. No precautions were taken by the Commission or their Engineers to prevent such an accident, though several officers were employed to inspect every part of the work while it was going on, and guard against its dangers. Indeed, the occurrence of such an accident did not appear to have entered the mind of any of them. Mr. Carson testified that it was "not the practice for inspectors to be present at any part of the work, except when the work was going on there."

The Construction Company were required to maintain a surface covering, and also to support the pipes underneath. The testimony presented to the Judge was strong and conclusive that the Company did properly support both. The Boston Gas Company refused, as already mentioned, to remove or relocate their pipes unless the Transit Commission would agree to pay the cost; but they allowed a contract to be made with one of their employees, without prejudice. After the work began on section 4, the President of the Construction Company called the attention of Mr. W. R. Addicks, who was then virtually Chief Engineer of the Boston Gas Company, to the advisability of the Company having constant inspection at all points where operations were going on. Mr. Addicks replied that he did not care to go to the expense, but was willing to put on a man at the cost of the Construction Company. The pay of a night inspector would not have exceeded $2·50. The parties arrived at the understanding before stated; and the Gas Company never inspected their pipes, which were uncovered at the crossing of the two streets, either to ascertain their condition or how they were supported, or in any respect gave the slightest attention to them except to see that the gates were in working condition. This, the Judge remarked, was in such striking contrast with the conduct of owners of other pipes there as to require notice. Mr. Addicks, when questioned upon this point, took up the position that the Engineers for the subway were responsible for the support of the pipes; and that in regard to them he would be only a subordinate. In a letter addressed to the Engineer of the Transit Commission on Dec. 5, 1896, the Treasurer of the Boston Gas Company (Mr. F. R. Addicks) wrote as follows: "This Company desires to file its disavowal of all responsibility for any damages resulting from leaks resulting from the gas-pipes as located by the Commission, or from any disturbance of the pipes caused by the building and operation of the subway." Mr. A. C. Burrage, the President of the Company, testified that they had not, that he knew of, any agents whose duty it was to see whether these pipes were properly shored up by the contractors; and that this was outside the province of the Company—that, in fact, they had no right there. He also testified that he "felt the gas-pipes were a source of a good deal of anxiety, and impressed a warning that every care should be used by the Transit Commission in dealing with them." The subject was discussed between Mr. F. R. Addicks, Mr. W. R. Addicks, and himself. In these discussions, Mr. Walter Addicks said repeatedly that he had always been opposed to the building of the subway under the pipes; that he had no control over the matter at all; and that he had made a suggestion that no cars should be run on street tracks over the subway work where pipes were in connection therewith. Mr. Burrage also testified that he, the Treasurer, and the Engineer were the three active executive officers of the Company; and that the Directors had not designated anyone to act as Manager. Judge Ely concludes his long report as follows:—

"I find that the Boston Transit Commission, by its Engineers, the Metropolitan Construction Company, and the Boston Gaslight Company, by their respective officers, knew, or, if in some particulars did not actually know, were in duty bound to know, substantially the age and general condition of these gas-mains; that they had been uncovered and exposed, within the covered vacant space in which the explosion occurred, for many weeks; that during this time they had been temporarily supported, and that the supports had been changed from time to time as the necessities of the subway construction required; that temporary supports of the best kind under such conditions, and frequent changes of supports, must put gas-mains to a severe test; that the vibrations caused by moving cars and vehicles largely added to the strain; that if illuminating gas escaped into this enclosed space it might explode with violence; and that, notwithstanding these conditions, neither of these parties took any steps to watch or inspect this enclosure or these pipes, when work was not going on, except that a man from the Boston Gaslight Company went over the line of the subway once a day and looked after the gates. On these facts, I find that each of the above-named parties were guilty of carelessness; and if proper precautions had been taken, this accident would have never occurred.

"I find that section 4 of the subway could have been built with safety under the requirements of the contract made for its construction with the Metropolitan Construction Company, if proper precautions had been taken.

"I find that the Boston Gaslight Company knew further that, in the construction of the subway, their pipes and mains were in constant danger; that if they left them to the care or carelessness of the contractors and their men, they committed them to inexperienced hands; and that thereby great dangers constantly menaced the people. These facts can be substantiated by the letters of Mr. W. R. Addicks, the Engineer of the Company. The position taken by the Company that they were not responsible for their pipes and mains when uncovered by the subway contractors, seems to me to be indefensible in every respect.

"I find further that the Company had a palpably insufficient number of jobbers in their employ on the morning of March 4. Surrounded as their pipes and mains were with dangers at many parts of the subway construction, it was utterly unjustifiable and inexcusable for the Company to allow a single moment to pass when it had not an intelligent and experienced jobber to call upon. And yet 33 minutes elapsed before a jobber could be found to attend to the leak which caused the explosion. I am fully satisfied, and I find, that if an intelligent and active jobber had been promptly sent in response to the telephone, the explosion would have never happened.

"I find that the Boston Gaslight Company had at all times full and complete control of its pipes, except so far as it was necessary to remove the earth and put in and take out supports in the construction of the subway; that no obstacles were placed in its way to the exercise of such control; that it was at liberty at all times to turn the gas on or off these pipes as it pleased, and to carry on its business in all respects as it had ever done. I understand the law to be that the Company, having been invested with important rights, were under legal obligation to exercise corresponding due care, and that the subway legislation and the action of the Boston Transit Commission and contractors under such legislation did not for a single moment relieve the Company of their obligation, but, on the contrary, the increased dangers to the Company's mains and pipes growing out of the excavation for, and construction of, the subway made it obligatory on the Company to exercise an equally increased amount of care and diligence. I understand further that the difference between criminal negligence and mere actionable negligence is not in kind, but only in degree.

"In my judgment, the facts hereinbefore stated require me to find, and I do find, that the negligence of the Boston Gaslight Company was gross and inexcusable. I therefore find that the death of William A. Start resulted from the unlawful act of the Boston Gaslight Company."

A separate inquiry was conducted by Fire Marshal Whitcomb, who has reported that the accident was due to lax methods of inspection pursued by the Transit Commission. After referring to the precautionary measures that might have been taken by the Commission, he says: "They should have kept careful and incessant watch. The failure of the Commission, holding as they did the strongest fiduciary relations to the public, to adopt precautionary measures, seems to me, in the light of the evidence presented, to constitute inexcusable neglect on their part. Whether the legislative Act creating the Commission or the common law itself imposed any obligations upon the Gas Company with reference to the care of their pipes or not, it was the duty of the Transit Commission, it seems to me, to whom the public had the right to look for protection from subway dangers, to guard against such. I have been unable to learn that there had been any inspection of the pipes and their supports by the Transit Commission or their agents within 24 hours preceding the explosion." The Fire Marshal finds the explosion and fire were not the result of any wilful act or omission on the part of any individual or corporation.

SUGGESTED PURCHASE OF THE DERBY GAS-WORKS.

The Derby Trades Council are busying themselves in trying to promote public interest in the question of the purchase by the Town Council of the Gas Company's undertaking. They called a meeting of ratepayers for yesterday week; but the attendance was only moderate. The gathering was presided over by Mr. W. B. Steer, whose view of the matter is that the profit derived from the gas-works ought to go towards disposing of the sewage of the town, providing libraries, and so forth. He pointed out that the Derby Gas Company made 45 million cubic feet of gas a year, and sold it at from 2s. 3d. to 2s. 8d. per 1000 cubic feet; and yet, he said, they had the very unwholesome spectacle of adults having to strike for wages of 23s. per week, while the shareholders were receiving dividends at the rate of 7½ and 10 per cent. Mr. Norman, a member of the Council, proposed—"That, in the opinion of this meeting of ratepayers of the borough of Derby, the time has arrived when it is essentially necessary to the well-being of the inhabitants that the Corporation should possess and control the gas supply of the borough, as it is out of harmony with these modern times that private companies should control and make profits out of concerns which ought to be managed for the good and well-being of the people; and we call upon the Corporation to again consider this question, and, if necessary, call a town's meeting with the view to ascertain their opinion of this matter." Mr. Norman strongly objected to monopolies by private companies, and urged that it was time the voice of the ratepayers should be heard in this matter. Mr. W. Warren seconded; and Mr. W. E. Harvey, in supporting, said that to make an attack upon selfish interests in a town like Derby was no light matter. From every side of the compass, they would be assailed by calumny and abuse before they succeeded in gaining the victory; and when that victory was secured, they would be told that they had been right all along, for nothing in this world succeeded like success. Personally he had never dealt with impracticable things; and he would go so far as to say that there was nothing more practicable than the question they had met to consider that evening. The principle of the resolution was a most reasonable one, and was anticipated by the Legislature when they made provision for municipalities to purchase gas and water works. All that was needed in Derby to make the purchase of the gas-works an accomplished fact was unanimity among the ratepayers. Mr. Harvey went on to refer to Nottingham, where he said they were producing gas at 2s. 1d. per 1000 cubic feet for the town, and 2s. 4d. for outsiders; and last year, after paying the trades union rate of wages, they handed over a profit of £20,000 in relief of the rates. The resolution was unanimously carried.

DUKINFIELD GAS SUPPLY.

Improved Financial Position of the Gas Undertaking.

At the last monthly meeting of the Dukinfield District Council, the Chairman of the Gas Committee (Mr. Stafford), in moving the adoption of the minutes, referred to the very satisfactory report issued by the Gas Engineer (Mr. Harrison Veevers) on the working of the undertaking in the year ending March 31. According to the statistics accompanying the report, the make of gas was 73,242,000 cubic feet, as compared with 67,224,000 cubic feet in 1895-6; while the sale was 67,612,100 cubic feet, against 60,997,000 cubic feet—an increase at the rate of 10·8 per cent. Special attention has lately been given to the renewal of mains and services, with the result that the leakage has been brought down from 9·26 to 7·68 per cent. The balance on the revenue account was £3536, as compared with £2395; and after paying the annuities and interest, and making the usual addition to the sinking fund, there was a balance of £345. Last year, the revenue balance was insufficient by £805 to meet these payments; so that considerable improvement has been effected. This will doubtless continue, as, the works being now in a position to manufacture gas on favourable terms, without any evident requirement of renewals for some time to come, no great expenditure will be needed on capital account for a few years, unless the demand for gas increases at an abnormal rate. Mr. Veevers gives a table showing the cost of gas per 1000 cubic feet sold for the last two financial years. It is seen therefrom that the net cost of production in the twelve months ending March 31 was 1s. 8·26d.; whereas in the preceding year it was 1s. 11·60d. The capital charges were 11·32d., against 1s. 0·58d. The net cost of production was therefore 2s. 7·58d., as compared with 3s. 0·18d.; and the average price of gas being 2s. 8·80d. and 2s. 9·03d., there is a profit of 1·22d. now, as compared with a loss of 3·15d. this time last year. Mr. Stafford, in the course of his remarks, said the works were at present in as good condition as ever he had seen them; and if the Committee succeeded in placing their coal contract well, he believed they would be able to reduce the price of gas. The Chairman (Mr. T. H. Gordon, J.P.) expressed the hope that the present satisfactory financial position of the gas undertaking would be permanent, and, if anything, improved. The minutes were passed.

BURSLEM CORPORATION GAS-WORKS ACCOUNT.

In a paragraph in last week's issue, it was stated that the result of the working of the gas undertaking of the Burslem Corporation during the past financial year was a profit of £1087; and from this it had been decided to transfer £1000 to the general district rate. Some additional particulars as to the position of the undertaking were furnished by Mr. T. Hulme in presenting the accounts to the Council. He said that the consumption of gas continued to increase to such an extent that additional plant would probably be required, and that the Gas Manager had been instructed to prepare plans and estimates of the cost of the extensions. The quantity of gas sold during the year was 141,897,000 cubic feet, as against 124,366,000 feet in the previous twelve months—being an increase of 17,531,000 feet. The receipts from the sale of gas amounted to £17,412, as against £16,063—an increase of £1349, notwithstanding a reduction in the price charged of 3d. per 1000 cubic feet in the previous year. This was accounted for by the increased consumption—largely through the extended use of prepayment meters. The receipts from this source had increased by £600 in the year. Another source of gain arose from the item of discount and bad debts, which was less by £227 than in the preceding year. Coke and other residuals realized £3369; but though the amount received was £205 more, it was, relatively to the quantity of fuel used, a less favourable result than in the previous year. The total receipts for the year amounted to £21,714, as against £20,301—an increase of £1413. The total expenditure was £20,626, as compared with £19,272 last year—an increase of £1354. The balance to credit was £1087, from which the Committee devoted £1000 to the ratepayers. Reductions in the price of gas during the last two years represented £4825—viz., £3150 last year, and £1675 the previous year. Therefore in two years the ratepayers had benefited by contributions to the rates to the amount of £2000, and by reductions in the price of gas to the extent of £4825; making the total relief £6825. This he considered highly satisfactory. Reduction of 3d. in the price of gas in the past year had been met by the additional consumption of 17½ million cubic feet, by an improvement in the leakage from 9½ per cent. to 7¾ per cent., and by a reduced cost of 1⅓d. per 1000 cubic feet in the annual fixed payments on account of capital, interest, rates, &c. The report was adopted.

ELECTRIC LIGHTING NOTES.

According to a Reuter's telegram, several places of entertainment in the Champs Elysées were obliged to close on Tuesday night, in consequence of the failure of the electric light, which was stated to be due to the breaking of a cable.

The Newmarket Town Council have resolved to accept the offer of Messrs. Edmundsons, Limited, for their Electric Lighting Provisional Order, on conditions which are to be embodied in a draft agreement to be prepared by the Town Clerk.

In suggesting to the Carlisle City Council, in connection with their scheme of electric lighting, that certain streets in the scheduled area should be lit by electric arc lamps as ordinarily used for street lighting, Professor Kennedy refuses to lend himself to the support of the deceptive lighting values frequently placed upon these lamps by electricians. He says: "Each lamp would be of the kind often called 2000-candle power;" but "probably 1000 to 1200 candle power would represent the real average better." The Town Clerk has been instructed by the Council to make application to the Local Government Board for sanction to the borrowing of the sum of £30,000 for electric lighting purposes.

Portsmouth appears to be striving with Edinburgh for supremacy in the matter of the cost of electricity production. At the last meeting of the Town Council, Alderman Ellis stated that a year ago he told the members that the cost per unit was 2·06d.; but during the past year it had been 1·70d., or rather under 1¾d. per unit. Of all the electric-light stations in the United Kingdom, the only town which beat Portsmouth in the lowness of the cost of production was Edinburgh, where it was 1·67d. But in Edinburgh coal cost only half what it did in Portsmouth. He added that a year ago he had to admit to a deficit of £400, but this year, after paying all charges, the profit was nearly £2400.

The completion of the first instalment of a scheme of public electric lighting in Manchester was considered of sufficient importance to justify the Electricity Committee in indulging in a little festivity last Thursday evening, in company with their friends of the Gas Committee. After dinner, Mr. Alderman Gibson, the Chairman of the Gas Committee, showed his impartiality and generous nature by proposing "Success to the New Undertaking." In doing so, he made some interesting remarks. He said that, when the electric light was first introduced in Manchester, he was one of those who urged that it should be kept in the hands of a Sub-Committee of the Gas Committee, in view of the enormous amount of capital invested in the gas business. But he had now learned enough to know there was no reason to suppose that the development of either undertaking was likely to cause any injury to the other. The contest would rather be, which would do most to promote the happiness of the community. In the three years since the introduction of electricity, the Gas Committee had been unprecedentedly busy; and during last year, the consumption of gas had been greater than previously. The consumption of electricity had increased by "leaps and bounds," and so had the consumption of gas, only in the case of gas the "leaps and bounds" had been bigger. Alderman Lloyd Higginbottom, in responding, quoted a number of statistics to show the rapid growth of the electricity business in the city. The capacity of the first plant put down was, he said, sufficient to maintain 40,000 lamps; but by March, 1894, this number of lamps was reached by 416 consumers. The Committee at once proceeded to put down plant for 16,000 additional lamps; but by the following March, the number of consumers had increased to 741, and the lamps to 66,914. The Committee therefore decided to make a very large extension, and ordered plant sufficient to supply an additional 64,000 lights; bringing the total capacity of the station up to 120,000 lamps. The demand, however, continued unabated; and by March, 1897, when the erection of the new plant was completed, its capacity was already exceeded—the consumers numbering 1581 and the lamps 143,398. As there was no sign of diminution in the rate of increase of consumers, immediate steps were taken to supply at least another 50,000 lamps during the coming winter. They would then have, with one exception, the largest generating plant in the world. At the present time, there was the equivalent of 145,962 lamps of 8-candle power connected to the mains, and there was the equivalent of 12,840 awaiting connection. There were 1615 consumers connected, and 36 waiting for a supply of the current. They had also connected with the mains 135 motors, aggregating about 235-horse power. There was a prospect of a large increase in the demand for electricity for motor power. This was supplied for 1½d. per unit, which was a much cheaper rate than power could be produced for by steam. The total output of current had increased from 439,379 units in the first nine months to 2,508,588 units in the year ended March, 1897. As to the revenue, at the end of the first nine months they had a debit balance of £210; the next year they made a profit of £5709; the year after, a profit of £11,138; and this year £17,000. In the meantime, they had twice reduced the price to the extent of 25 per cent.; and he expected they would soon have to consider the question of a further reduction.

SAN PAULO GAS COMPANY, LIMITED.

The Annual Meeting of this Company was held last Tuesday, at Winchester House, Old Broad Street, E.C.—Mr. D. M. Fox in the chair.

The Secretary (Mr. G. Rogers) having read the notice calling the meeting, the report and accounts, to which allusion was made in the "Journal" for the 11th inst., were taken as read.

The Chairman said he had again on this occasion to commence his remarks with words of regret for the loss the Company had sustained by the death of an esteemed colleague—Dr. Edward Batt, who for many years served the Company, as a Director, faithfully and well. Turning to the results of the working of the year, he congratulated the shareholders upon the report and accounts. This was the first occasion on which they had had annual accounts with the report. Previously they had had a half-yearly visitation of accounts, without a meeting; but the new system of annual accounts would facilitate comparisons being made by the shareholders as to the position of the business. From the revenue account for the year it would be seen that for public lighting they had received £27,402; and for private lighting, £59,249—making a total of £86,651. These figures compared with £25,463 for public lighting and £62,503 for private lighting in 1895. It would therefore be seen that they had had an increase of nearly £2000 in the public lighting, but a decrease of £3254 in the private lighting—making the decline in the gas receipts £1315. Their contract was on a gold basis; and they were entitled to make their charges in gold at the par of exchange—27d.—for the gas sold both for public and private lighting. But as a matter of fact, they only charged in gold for the public lighting; and therefore that always remained constant. With the private consumers, however, as a matter of expediency, they did not exercise their right, as, with the fall of exchange, it would raise the price to such a large number of reis per cubic metre that it would be vexatious and prohibitive. Therefore, if exchange dropped, the Company obtained less per cubic metre. Had the exchange remained at the rate of 1895, they would have received £65,437 last year, instead of £59,249. This showed how greatly they were affected by the fall in exchange; and it rested upon the Directors and their Manager to adjust their charge to a rate that was suitable and agreeable to both the customers and the Company. To further illustrate how exchange influenced the results, he said the public lamps were paid in gold at 27d., which was equal to 260 reis per cubic metre; and multiplying this by three—that was taking the rate of exchange at 9d., made 780 reis, which was what the Government were actually paying them per cubic metre. If they were to so choose, the Company could charge the same for the private lighting; but they were now charging consumers 540, or gold at 13d. exchange. If the private lighting had been at the same rate as the public lighting, the revenue from private consumers in the past year, providing there was no diminution in their number, would have produced no less than £85,500, as against £59,249. But it was hardly necessary for him to tell the shareholders that, at a higher rate, they would in all likelihood have had a much smaller number of consumers. Besides, the policy they were pursuing was the one which popularized an enterprize of this kind with the people; and certainly the Company would not have been in their present position if the Directors had followed a hard-and-fast policy. The next item was the residual products; and the shareholders must be struck with the large development under this head. Coke had produced £12,728; and tar £1872—a total of £14,600. This was a very large sum indeed to realize for the residual products, which five years ago seemed to have been neglected, with the consequence that in 1892 they only obtained from them about £7800, and in 1895 £9800. From this to £14,600 was a splendid increase for one year; and it was partly because they had been devoting their attention to the development of the trade in these products. Of course, in an inland town like San Paulo, there must be enormous scope for such an article as coke. On the other side of the accounts, coal had cost £34,665, as compared with £34,525 in 1895. They had carbonized some 200 or 300 tons more coal; but the price had been slightly lower. Lime and oxide had cost £930, against £1082; wages at works, £5573, against £5933; and repairs, renewals, and extensions of plant, £11,071, against £13,731. With reference to the last item, something like £5000 of the sum named had been spent upon extensions, which increased the value of their property, and which might some day be recoverable from capital. Having made comparisons of the other items in the accounts, the Chairman remarked that the shareholders would have seen that the assets had been written down to the rate of exchange on the last day of the year for which the accounts were made up; and the receipts and expenditure had been converted at 9d.—being the average rate on remittances during the year. It would also be noticed by the shareholders that since the year 1894 no addition had been made to the amount standing in the accounts as the outlay on the works—£245,861; and nothing had been deducted for depreciation, but they were worth more. As to the expiration of the Company's concession and the inviting of tenders by the State Government, that, of course, was the most important matter mentioned in the report; but it was the one upon which he had least to say. What he foreshadowed at the last meeting had come to pass. Tenders had been asked for, and none had been received; and therefore the Company were in a pretty good position in this respect. Negotiations were now in progress between the Government and the Directors; and he was sure the shareholders would have full confidence in the Board in this matter.

Mr. J. R. Tyndale seconded the motion.

Mr. W. C. Fowler suggested that early intimation should be given to the shareholders as soon as anything definite was done in regard to the new concession. He thought the shareholders might congratulate themselves upon the present competent management of the Company. If they had had good management ten or fifteen years ago, the concern would have occupied a far different position to what it did now. He also considered that a Board of three was too small for an undertaking in which £250,000 was invested; and he suggested that, at the conclusion of the negotiations for a new contract, the number of Directors should be increased.

Questions were asked bearing upon the new concession; but it was pointed out that they were all the subject of negotiation.

Mr. J. E. Jones expressed the opinion that the Directors had acted very wisely in turning their attention to the reduction of stocks. Two years ago they stood at something like £55,000; and now they figured in the accounts at a little under £23,000.

The motion was unanimously carried.

On the proposition of the Chairman, seconded by Mr. J. Barker, a final dividend of 5 per cent. was declared, free of income-tax, making 10 per cent. for the year.

The retiring Director (Mr. Barker) and the Auditors (Messrs. Cash, Stone, and Co.) were re-elected.

The Chairman, in moving a vote of thanks to the officers and staff, spoke in high terms of the manner in which the Manager (Mr. Henrick), the Engineer (Mr. Wood), and the Secretary had worked during the past year.

Mr. S. Spencer seconded the motion, which was heartily agreed to.

Acknowledgment was also made of the services of the Chairman and Directors; and the proceedings then terminated.

BELGRANO (BUENOS AYRES) GAS COMPANY, LIMITED.

The Amalgamation with the Argentino Company.

An Extraordinary General Meeting of this Company was held last Tuesday, at Winchester House, Old Broad Street, E.C.—Mr. C. P. Ogilvie in the chair—for the purpose of confirming the resolution passed at the meeting on the 27th ult., ratifying an agreement between the Company and the Argentino Gas Company for the sale of their respective undertakings to a new Company (see *ante*, p. 1000).

The Secretary (Mr. H. T. Adkins) having read the notice calling the meeting,

The Chairman, in moving the confirmation of the resolution, said the Argentino Company also held a meeting on April 27, and agreed to the sale of their undertaking to the new Company; and therefore when the resolution was confirmed that day, the shareholders might consider themselves a new Company embodying the shareholders of the Argentino Company. He did not wish to build castles in the air. But he believed they would become a very powerful Company; and that the shareholders would in future be satisfied with their dividends. He did not propose to throw out hints as to large dividends; but he did think they would have a steady dividend in the future. One question had been raised. If any difficulty arose on the other side, it would not be their fault here; and the Argentino Company would have to carry it through, at their cost. The agreement was conditional "on the requisite resolutions being passed and confirmed, and the respective old Companies and their representatives being in a position legally to sell and transfer to the new Company their respective undertakings and property." Therefore the new Company would come into a legal position with no binding payments to be made, and no obligations. The new Company would take over both concerns as a clean business.

Mr. C. J. Hegan seconded the motion, which was unanimously agreed to.

The Chairman next proposed the declaration of a dividend of 4½ per cent.; making, with the interim dividend, 7 per cent. for 1896. He remarked that, had the sale of the undertaking not taken place, the Directors would have been compelled to use some of the revenue for capital purposes; but the fact that the new Company had taken over the business would free a large amount of capital.

Mr. Hegan seconded the motion, which was agreed to.

Mr. R. Nesham, a Director of the Buenos Ayres (New) Gas Company, moved a vote of thanks to the Chairman and Directors and the officials. He observed that, in his own case, this vote was not merely a compliment; but he felt grateful to the Directors for the careful way in which they had carried this business through, which he could not but think would be for the good of the shareholders in the future. He also mentioned that he had heard very good accounts of the way the Company was managed in Buenos Ayres.

Mr. S. Spencer seconded the motion, which was heartily adopted.

The Chairman, in responding, said this matter had given the Board and officials a great deal of trouble; for they had honestly worked at it. Although he could not tell the shareholders his reasons now, he felt satisfied they had done a right and proper thing.

SOUTH AFRICAN LIGHTING ASSOCIATION, LIMITED.

The Annual Meeting of this Association was held at the Offices, 90, Cannon Street, E.C., on Wednesday last—Mr. D. Ford Goddard, M.P., in the chair.

The Chairman, in moving the adoption of the report and accounts, said he thought the shareholders were to be congratulated on the very satisfactory state of the Association. This fact had evidently been appreciated by the proprietors, for during the past year the new capital had been eagerly subscribed for; and the premium of £1800 resulting from the issue now showed in the Company's accounts. He was pleased to be able to report an increased sale of gas at both Port Elizabeth and Grahamstown. At the former, the number of cubic feet sold showed an increase of 18 per cent. over the preceding year; while at the latter, the sale had more than doubled. At Grahamstown the return for net revenue was equal to about 3 per cent. on the capital employed there; and though this might appear small, it must be borne in mind that the works were new, and capable of producing a much larger make. The cost of coal had during 1896 been a most important factor; and he might say, in further explanation of the paragraph in the report, that coal had cost the Association about 8s. per ton more in 1896 than in 1895, or an increase of about 1s. per 1000 cubic feet of gas. This was due to increased rates of freight and to some heavy charges for demurrage which had been caused by circumstances over which the Association had no control. In common with all other gas companies, the electric light was a possible competitor; and latterly at Port Elizabeth there had been some talk of an installation of the light being made in connection with the electric trams. By improved lighting with incandescent lamps, which the Association were now putting up in the streets, the Directors were endeavouring to meet the competition. The loss from leakage at Port Elizabeth showed a gratifying reduction last year, and had diminished to only 8·7 per cent. The

£1000 now to be added to the plant and depreciation account he looked upon as an additional safeguard to the undertaking. The work of extending and altering the plant was a very considerable capital addition to the works of the Association at Port Elizabeth; but with the £1000 now appropriated, £4000 out of the £6057 spent would have been charged to revenue. Some desire had been expressed that the Board should publish more details in the accounts sent out to the shareholders. He was of opinion that in the case of the Association this was not desirable. The Association was not on the same footing as a gas company in the United Kingdom; and, in addition, it was carrying on operations in two towns. In reply to inquiries from Mr. Davies and others, the Chairman went on to say that the new holder was an additional one, and that a call on the new shares would probably be made during the autumn. The present price of gas at Port Elizabeth was 10s. 10d. per 1000 cubic feet, less discounts. The charge for plant depreciation account was in addition to all ordinary charges for renewals and repairs, which had been placed to revenue.

Mr. CORBET WOODALL, M.Inst.C.E., stated that the Association had already offered to supply electric light to the Municipality; but the offer had not been accepted. The stocks on hand, which appeared large, were made up of coal, meters, fittings, pipes, &c., of which the Association had to hold a heavy stock in consequence of the distance from London.

Mr. W. WOODALL, M.P., having seconded the motion, and it having been carried unanimously,

The CHAIRMAN proposed, Mr. J. MANSERGH, M.Inst.C.E., seconded, and it was unanimously resolved, that a dividend of 10 per cent. for the year 1896, less the interim dividend of 2½ per cent. already paid, be declared.

Mr. W. WOODALL, M.P., was re-elected a Director, on the proposition of the CHAIRMAN, seconded by Mr. HOLLAND; and the Auditor (Mr. J. G. Griffiths, F.C.A.) was also re-elected.

Mr. SHAND proposed, and Mr. HOLLAND seconded, a vote of thanks to the Directors, to Mr. Corbet Woodall, the Engineer, and the officials of the Company, for their satisfactory conduct of the business of the Association in 1896; and it was carried unanimously.

The CHAIRMAN having replied, the proceedings terminated.

MONTE VIDEO GAS COMPANY, LIMITED.

In the report to be presented to the shareholders of the above Company at the ordinary general meeting next Friday, the Directors state that the profit on the working of the past year is £25,648, which has been passed to the credit of profit and loss, and increased by interest and discount, profit realized by the sale of securities, and the balance brought forward, to a total of £36,341. The balance available for distribution is £31,552. The Directors paid on Nov. 21, 1896, an interim dividend of 10s. per share, less income-tax; and they now recommend the payment of a further amount of 10s. per share, also less income-tax—making 5 per cent. for the year. This will absorb £27,096, and leave a balance of £4456 to be carried forward. The reserve account remains at £74,000, and the insurance fund at £12,500. The 12½ per cent. reduction in the price of gas, which took effect as from July 1, 1896, was followed by an increase in the number of consumers and in the consumption of gas; and both these would doubtless have continued to grow very satisfactorily had not the disquiet and unrest in political matters that prevailed in the closing months of the year at length culminated in open revolution. This (following on a locust plague) abruptly checked business and all growth in the revenue from gas. On the other hand, the sales of products continued good; and the year's revenue from the dock, workshops, tug, &c., was the largest on record. So that to pay the dividend of 5 per cent. for 1896, it is only necessary to take £2175 from the balance of undivided profits brought forward; leaving intact the large amounts at credit of the reserve accounts. The whole of the Company's plant and property in Monte Video is thoroughly well upheld; while the most rigid economy, consistent with full efficiency, is being continued in every department.

Crowborough Water Supply.—Under the advice of Mr. C. Dawson, F.G.S., boring operations have been in progress at Crowborough for the purpose of obtaining a supply of water for the town. Water was found last Tuesday, on the border of the Purbeck beds.

Surrey and the London Water Question.—At the meeting of the Surrey County Council last Tuesday, it was decided to assent to a very important recommendation of the Parliamentary Committee to authorize them to appear before the Water Commission, with such expert advice and evidence as may be necessary for the purpose of establishing the decision arrived at by the Council—"That no settlement of the water question can be satisfactory which does not secure to the county and its local authorities the control of the sources and distribution of the water therein."

The Local Government Board and "Extras."—An inquiry was held last Tuesday, by Mr. R. H. Bicknell, M.Inst.C.E., on behalf of the Local Government Board, into the application of the Tottenham District Council to borrow £1590 for the purposes of water supply; the sum named being the balance due on the contract for machinery, pumps, and boilers at the Longwater pumping station. In 1887, sanction was granted for a loan for £3988, of which £3860 was for machinery. In 1893, authority was given for the borrowing of another £1800 in respect of additional works. The Inspector went very carefully into the various items, and took exception to some of them. He did not, for instance, think the Council should have a loan for cleaning engines after long storage. The usual practice if one had to store engines was to cover them with tallow or vaseline. A charge for "cleaning boilers for inspection" was impossible; loans were not granted for such purposes. The items termed "extras" in this case amounted to a very large sum; and when the Council found the expenses amounting to between £1000 and £2000, they should not have incurred them without the sanction of the Board. It must be remembered that on three or four occasions the Board had called their attention very strongly to the fact that they had done work previous to getting official sanction; and this was a practice the Board disliked exceedingly. The Council ran great risk in doing such things.

WEST MIDDLESEX WATER-WORKS COMPANY.

The Half-Yearly General Assembly of this Company was held at the Offices, Marylebone Road, last Tuesday—Mr. EDMUND BOULNOIS, M.P., in the chair.

The CHIEF CLERK and SECRETARY (Mr. F. H. Wybroo) read the notice calling the meeting, and subsequently the Auditors' report, which stated that the gross rental for the half year to Lady-day had been £132,226; showing an increase of £3845 over that for the corresponding period of the previous year. The balance to the credit of the dividend and interest account was £61,524.

The CHAIRMAN, in moving the adoption of the report and accounts, said he thought they would agree with the Directors that the condition of the Company remained very satisfactory. They continued to prosper; and, as they had just heard from the report of the Auditors, their revenue had increased during the past half year. At the same time, he must remind them that their expenses had also increased—not the expenses which were under the control of the Board so much as those which were placed upon them by outside authorities. The rates of the Metropolis appeared to be everlastingly on the increase; and the Water Companies and the other great industrial undertakings in London seemed to suffer more severely than other people from this fact. They did their best to prevent their assessments from being placed higher than they considered just; but the Water Companies, like others, were considered, as far as he could see, fair game by the local authorities to put to the extremest limit they could. When they met the previous half year, the whole of their new works at Barnes Elms were not actually completed. They were now finished, and were full of water; and he thought it was safe to say that they had four of the finest reservoirs in the world. At all events, all anxiety on account of any scarcity of water was removed by their having this splendid reserve; and a great weight must be taken off the mind of the Engineer when he looked on their resources, and knew that in the event of any drought or accident, there was an ample supply for the consumers in their district. The report mentioned that the Purchase Bills of the London County Council had again been brought into Parliament this session; and, as the proprietors were aware, they contained the same provisions as the Bills which were rejected last year. They contained terms of purchase which the Directors considered were unfair to the investor in a water company, and which, he ventured to say, Parliament also thought unfair, because, as they were aware, the Bills, after a discussion of about five hours, were thrown out in the House of Commons by a majority of more than two to one. Simultaneously with the rejection of the Bills, the President of the Local Government Board announced that the Government were about to appoint a Royal Commission to consider a variety of subjects connected with the Water Companies of the Metropolis and the outside area which had not been investigated before. The great question which they would have to decide was whether it was to the interests of the ratepayers in the Metropolis and the suburbs, as well as of the consumers of water, to purchase the undertakings of the Water Companies. This was a subject which had never been inquired into by any responsible body or authority. The London County Council had their own views upon the point; and there had been reports made from time to time by those who considered, at all events, that they were capable of investigating the subject—which, as far as he knew, had not been entirely in accordance with the view that it would be wise for the ratepayers to purchase. No authoritative inquiry or investigation had, however, ever taken place. This they would now have; and it remained to be seen whether the theory put forward—that it would be to the immense advantage of the consumer, as well as of the ratepayer, that the purchase should take place—would be substantiated. The other subject which the Royal Commission would have to take into consideration, was the advisability and the practicability of severing the areas. As they were aware, there was what was called a Metropolitan area and an outside area; and very serious questions affecting the interests of the ratepayers, both in the inner and the outer district, were involved in the question of separation. A decision could only be come to after a solemn and serious inquiry as to what the effect would be if such a severance occurred. As far as their Company were concerned—and he believed he might also speak for the London Water Companies generally—they would offer every assistance to the Royal Commission in their investigation, because they believed that in a full, fair, and impartial inquiry they could come to no harm, but that, on the other hand, many matters would be elucidated which had not yet been brought to the public notice. At the same time that the President of the Local Government Board announced the appointment of a Royal Commission, he said that the Government were going to introduce a Bill of control. This sounded formidable, he (the speaker) admitted; but, as far as one could gather, it was to be a Bill more to give opportunity and facility to consumers to lay before a fixed tribunal—which they were not able to do at present by law—any complaints which they might have as to the quality or the quantity of the water supply which they might receive. As far as their Company were concerned, he did not think that they had any reason to fear the introduction of a Bill of this kind. They had always endeavoured to carry out their statutory obligations to the consumers. They had never shirked their duties; and the fact that so few complaints from the consumers reached the office, was a very fair indication, at all events, that they were doing their best in the consumers' interests. There was one other subject mentioned in the report—the Staines reservoirs. As the proprietors were aware, they sent three representatives to the Staines Reservoirs Joint Committee; and though it was no part of their duty to report upon the subject, still he thought it would be interesting to them to know that considerable progress was being made with the purchase of land at Staines for the projected subsiding reservoirs. They were meeting constantly. They were arranging with the owners of the land for purchase; and they would shortly be in a position, he expected, to enter into a contract for the works. When this reserve of water was in the hands of the three Companies concerned, he thought they would be in a position to sit perfectly calm and comfortable for a great many years to come. Before concluding, he would like to say that the Directors felt that, though they might do their very best in the proprietors' interests, they would not be able to satisfy them completely if it were not that they were aided by a capital staff. The whole staff were loyal, willing, and able;

and controlled as they were by Mr. Wybroo (the Secretary) and Mr. Hervey (the Engineer), they were able to carry on their undertaking in a perfectly satisfactory manner. He knew of no Company better served by officers than the West Middlesex.

The DEPUTY-CHAIRMAN (Mr. Jackson Hunt) seconded the resolution, which was carried unanimously.

On the motion of the CHAIRMAN, seconded by the DEPUTY-CHAIRMAN, a dividend on the consolidated stock was declared for the half year ended March 31 at the rate of 10 per cent. per annum.

Sir W. H. WYATT then stated that they had appointed three members on the Staines Reservoirs Committee; and they had now to settle with these gentlemen the question of their remuneration. He was sure that they would have a great deal of work to do; and he was equally certain that they would do it well. The other two Companies who were connected with them in this matter had agreed to pay their representatives £500 per annum; and they themselves could not do less. He therefore moved that an amount of £500 per annum be paid for division among the three representatives of this Company on the Staines Reservoirs Joint Committee, in addition to their remuneration as Directors.

Mr. A. WARD seconded the motion, which was carried unanimously.

Resolutions were also passed re-electing the retiring Directors (Messrs. J. Hunt, W. P. Bodkin, A. M. Mackinnon, and G. B. Hall) and the two Auditors who offered themselves for re-election (Mr. C. R. S. Dimsdale and Mr. George Pitt). To fill the vacancy on the audit caused by the retirement of Mr. H. R. Solly, Mr. F. E. Bodkin was appointed.

A cordial vote of thanks to the Chairman and Directors closed the proceedings.

LAMBETH WATER COMPANY.

The Half-Yearly Report.

The report of the Directors of this Company for the half year ended March 31 states that during this period 1201 houses and other supplies of water, estimated to yield an annual rental of £2920, have been connected with the Company's works, against 1238 houses, &c., producing a rental of £2833, laid on during the six months ended March 31, 1896, when the number of new supplies put on during that half year was larger than in any corresponding period since 1886. The revenue account shows an increase of £3695 in the water rents, &c., and a decrease of £7042 in the expenditure, as compared with the corresponding period last year, when, however, the sum of £7727 was brought forward, in respect of frost service in 1895. The surplus transferred to the dividend and interest account is £73,199. There is to the credit of the latter account, after payment of interest on debenture stock, an available balance of £71,219. This amount is sufficient to pay dividends at the maximum rate on all the share capital; but, having regard to the desirability of maintaining as far as possible a uniform rate of dividend, the Directors have decided to transfer the sum of £2000 to the contingency fund, and recommend that the maximum dividend of 7½ per cent. per annum be paid on the shares issued under the Company's Act of 1856, and that a dividend at the rate of £9 15s. per cent. per annum be paid on all the other share capital of the Company. A balance of £1615 will remain to be carried forward, after making provision for a payment of £1486, which will have to be made to the Chamberlain of the City of London under the sinking fund clause of the Company's Act of 1886 in respect of debenture stock issued under that Act. The total sum already paid to the Chamberlain is £5510, and he is now the holder of 20½ shares (10 per cent.) in the Company. Constant supply was laid on to 819 houses during the half year; and it is now given to 67,787 out of a total of 106,098—being 63·9 per cent. of the whole number, or 86·4 per cent. of the houses, &c., supplied in the Administrative County of London.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

Few will read the announcement of the death of Mr. Robert Mitchell, of Edinburgh, without a feeling of deep sadness. Mr. Linton's death was pathetic in its circumstances; Mr. Mitchell's is scarcely less so. The one was removed before the Gas Commissioners were able to release him from his labours; the other has survived his retirement not quite two months—a period so short that it almost, looking back, makes his retirement a mockery. Had it been anticipated that Mr. Mitchell was to enjoy so short a spell of rest, I am sure that he would not have been allowed to go as he did, but would have been permitted to hold on, till, at least, the important works he was engaged upon were completed. Who can tell the anguish which it must be to see one's dearest schemes pass into the hands of another for fulfilment? Yet such was Mr. Mitchell's lot; and I doubt not but that it must have grieved him much. Probably it hastened his end. When I saw him last, a day or two before he quitted office, his spirit seemed gone; it was manifestly an effort to him to appear cheerful. He had taken to heart the prospect of living without working. He had been so long accustomed to strive and fight with adverse circumstances, that without them, life to him had no aim. Mr. Mitchell, more than any other gas manager I know, led a hard life after he went to Edinburgh. He had to provide a high quality gas, entailing anxieties, which are, however, shared by others, in the matter of coal contracts and coal deliveries. But where the troubles of others ended, his began. He had no room to store the different classes of coal; and thus the toil of producing the correct "mixture" at all times was greatly increased. Further, the output of gas was rising by leaps and bounds; and what available space there was, was being continually eaten away by extensions of plant. Distraction, bordering on despair, must often have laid hold of him, as he saw corner after corner taken from his storage space. I entertain no doubt that the conditions under which he worked are largely accountable for his illness.

No estimate of Mr. Mitchell's character is at all capable of being accurate which leaves out of account that he was entirely a self-made man. He had not the advantage of the high training which many of his compeers have had; and therefore the doing of the same amount of work entailed more labour upon him than upon them. But that is not all. In order to attain the position he did, his studies must have been more severe than those of a seminary-bred young man. The point of this observation is that he was essentially a student all his days; and the social side of his nature suffered. A Gas Commissioner complained to me once that Mr. Mitchell had no conversational powers. That is not the whole truth. The statement should have been that he was not a gossip. He had not time to spend upon tittle-tattle. He could speak, and to the point, upon business subjects; and consequently he was at home in all gatherings of gas managers or workers. It is impossible to speak too highly of him as a master. His assistants were devoted to him, and he to them; for he used to speak in terms of the highest praise of those under him. With so many good traits about him, the wish is natural that the end of his days should have been blessed with more brightness than has been the case. But fate is inexorable; and we can now only express our melancholy at so promising a life being cut off, and at the clouds which gathered round him in his later days.

It is not out of place here to recall that Mr. Mitchell's death is the third among the leading gas managers of Scotland within eight months. Mr. John M'Crae, of Dundee, died in October; Mr. F. T. C. Linton, of Leith, in December; and now Mr. Mitchell. This is a heavy drain upon a single talent in a small country like Scotland.

The Stirling Gas Bill, as you will know, has made little progress in Parliament. As I anticipated, the promoters of the Bill object to those who have signed the petition against it being heard. The point has not been decided; but it will be before these Notes are published. I need, therefore, not refer to the matter further this week.

The Falkirk Town Council were very sharply divided, at their meeting this week, over the appointment of a Gas Examiner. The Committee recommended Mr. Marshall, a gentleman who is already in the employment of the Commissioners; but only on condition that he should be able to satisfy them of his capability for the post. Mr. Gordon, one of the Commissioners, thought that the person to be appointed should be a chemist, who would be able to tell them—not merely what the illuminating power of the gas was, but also if there were impurities in it. He proposed that Mr. Cormack, a science teacher, should be appointed. Provost Weir supported the second proposal. The proposal was to give Mr. Marshall £10 a year; and on the other side, to give Mr. Cormack £25. This circumstance makes me almost think that the consideration in putting Mr. Cormack forward was not alone the good of the gas undertaking, but something personal. As it was, Mr. Marshall was appointed, which was surely the right thing, because it is not to be supposed that at present there is no test of the gas as to its purity. Testing for illuminating power is new; the Commissioners having just had a photometer fitted up. The continuation of the former test, with the addition of the photometer work, was all that was necessary; and a new official was scarcely required for that.

The Stonehaven Gas Company held their annual meeting on Monday. It was reported that the profit for the year amounted to £512, which was equal to a dividend of 4s. 1d. per share; but it was agreed to pay a dividend of 2s. 6d. per share, with a bonus of 6d., and to carry the balance to the reserve fund. The Chairman congratulated the shareholders on the satisfactory financial position they were in, and attributed it to the increased consumption of gas which was due to the adoption of the latest appliances, and to the able management of their works by Mr. Graham Ross.

The Greenock Gas Trust, in connection with their coal contracts, received 36 offers for 142 different coals. They have selected 23,000 tons—in quantities of 3000, 2000, and 1000 tons. They have also contracted for 500 tons of Pumpherston oil for the Peebles process. At a meeting of the Police Board on Tuesday it was agreed to extend the installation of street-lighting by incandescent gas-lamps; experiments which have been made having proved to be satisfactory.

"Familiarity breeds contempt" in many matters; but it should not be allowed to proceed to that extreme in the case of a gas-fitter in the employment of a Gas Commission—especially when searching for an escape of gas. That seems, however, to have been the case with one of the fitters in the employ of the Dundee Corporation. An escape of gas was detected in a house in the city on Monday; and a young woman was removed from the house in an insensible condition. The gas-fitter, on arriving—notwithstanding that the house was full of gas—struck a match, and an explosion resulted which so wrecked the house as to make it uninhabitable. It is now shut up, and in the hands of the police. The Gas Committee have remitted to a Sub-Committee to do what is right in the matter of compensating the tenant of the house. The public are frequently told of the folly of searching for gas escapes with naked lights; but in the case of a gas-fitter, the action is not only a foolish one—it is most reprehensible.

A public meeting of ratepayers in Monifieth was held on Tuesday night, to consider the subject of the lighting of the burgh. After discussion, it was proposed to delay the matter; and it was also proposed that the Police Commissioners should approach the Broughty Ferry Gas Commissioners with a view to procuring a supply of gas from there. The meeting, by a considerable majority, voted for delay. As the number attending the meeting was small, it was held not to be a sufficient representation of the state of feeling in the community. Accordingly, at the close of the public meeting, the Police Commissioners met and resolved to take steps for the adoption of the Burghs Gas Supply Act, with a view to the erection of gas-works for the town.

The Dundee Gas Commissioners considered, on Monday, the proposal to purchase three acres of land to the east of the gas-works, for extensions. It is understood that the land can be acquired at the price of 26s. per pole. The Commissioners resolved, before going further into the subject of extension, to procure a report upon it from Mr. Foulis, who was consulted by the Dundee Corporation when they acquired the gas undertaking in 1868-69, and has been frequently called in since by the Gas Commissioners.

Incandescent Gas Lighting at Kingston.—The Kingston-on-Thames Town Council have sealed an agreement with the Gas Company for fitting up and lighting with incandescent burners a minimum of 500 street-lamps in the borough at £3 7s. 6d. each per annum; the payment to include the renewal of mantles, repairs, &c. The arrangement continues for three years.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *May* 22.

Sulphate of Ammonia.—The market has been firm throughout the week; and values have been fully maintained—closing quotations being £7 11s. 3d. per ton f.o.b. Hull, £7 12s. 6d. per ton f.o.b. Leith, and £7 15s. per ton f.o.b. Liverpool. There has been a fair export demand; but this has again been mainly from the West Coast ports. Home consumption is well sustained in Scotland; and makers are kept rather bare of stocks. In England, the home demand has fallen off; but, production being much reduced, supplies are nowhere accumulating. In the forward position, buyers, having to some extent availed themselves of the low speculative quotations recently current, sellers have become more reserved; and prices about on a level with spot values are required for delivery up to the end of the year. Makers hold aloof, unless for near delivery.

Nitrate of Soda is weak, at 7s. 9d. per cwt. for ordinary up to 7s. 10½d. per cwt. for fine quality.

LONDON, *May* 22.

Tar Products.—The low prices of 90's benzol has brought in speculative buyers. A considerable quantity has changed hands. Dealers are now only offering 1s. 4d. for 90's, and 1s. 10d. for 50's; while toluol has also fallen 3d. In sympathy with these lower prices, crude naphtha is quoted lower. It is difficult to see what has brought about this extraordinary collapse in the value of benzols. It is true anilines are weaker; and dealers have magnified the falling off in the shipment of aniline to the States. The consumption of aniline, however, is undoubtedly extending in all directions; and, while one or two markets are flat, others are active to the extent of fully compensating for the former. At present prices benzols will again go largely into gas makers' hands for enrichment purposes—indeed, a large contract has been concluded within the last few days for this purpose. There is no life in pitch, which is varyingly quoted from 18s. 6d. to 21s. per ton at different ports; while anthracene continues flat. Creosote and tar oils are brisker, with a good deal more doing. Carbolic acid is selling freely; and the quotation depends on whether the consumption is at English makers' works or for shipment—at least 4d. per gallon representing the difference between the two outlets.

To-day's average prices are: Tar, 14s. to 18s. Pitch, 18s. to 21s., according to port of shipment. Benzols, 90's, 1s. 4d. to 1s. 5d.; 50's, 1s. 10d. Toluol, 2s. Solvent naphtha, 1s. 7d. Crude, 30 per cent., naphtha, 10d. Creosote, 1¼d.; liquid, 2¼d. Heavy oils, 35s. Carbolic acid, 60's, 2s. to 2s. 4d. Pressed naphthalene, 62s. 6d. Creosote salts, clothed, 25s. Anthracene, "A," 6d.; "B," 5d.

Sulphate of Ammonia shows no important improvement. Business is fairly good; and new markets are opening for it. The home consumption this year will probably be the largest that has ever taken place. Prices obtaining during the week have been: London, £7 10s.; Liverpool and West Coast ports, £7 12s. 6d.; Hull and North-East ports, £7 11s. 3d.; Leith, £7 11s. 3d., less 3½ per cent.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—There is still nothing of any very special moment to report in connection with the gas coal trade; and but a very limited weight of business has yet been settled with regard to the usual season's contracts. Where colliery proprietors have been quoting any advance upon last year's prices, the gas companies and corporations are for the most part holding back; and though in some instances it is anticipated that on special qualities of gas coal they may possibly have to pay a slight advance over the low rates of 1896, generally it would appear to be very questionable whether any appreciably better prices will be got this year—at any rate, on ordinary descriptions of gas coal—where buyers take large quantities. Many of the colliery owners are, however, not competing at all for gas coal, owing to the unremunerative prices; and this may possibly help to strengthen the position of other colliery concerns that are going in for this class of business. With regard to locomotive fuel, there is also a strong disposition to hold out for an advance upon last year's excessively low prices; and though one of the largest of the companies has already secured some portion of their requirements on the same basis as last year—viz., 5s. 9d. per ton—many of the collieries from whom supplies are invariably taken are expressing a determination not to enter into contracts unless they can get better prices than the above, as they can place their coal more advantageously in other quarters. In the general round coal trade a fairly satisfactory tone prevails; and pits are kept on about five days per week, with prices unchanged. Steam and forge coals are in moderate request; but supplies are ample, and prices low. Engine fuel meets with a ready sale; and though the output of slack is above the average, supplies are not excessive, with the result that prices show a continued hardening tendency—an advance of about 3d per ton being quoted on forward contracts. At the pit mouth, best Wigan Arley averages 10s. to 10s. 6d. per ton; Pemberton four-feet and seconds Arley, 8s. to 8s. 6d.; steam and forge coal, 5s. 9d. to 6s. 3d.; engine fuel, 3s. 3d. to 3s. 6d. for common, 3s. 9d. to 4s. 3d. for medium, and 4s. 6d. to 5s. for best sorts. The shipping demand is fair; but prices show no improvement—common steam coal being obtainable at 7s. 3d. to 7s. 6d. per ton delivered at the Mersey ports.

Northern Coal Trade.—There has been a decided ease in the coal trade of this district during the last few days, partly through the non-arrival of steamers that had been expected to load, and partly because there is less rush now that the first shipments to the Baltic ports are over. It is probable, however, that the week before the holidays will witness more activity, as buyers often stock before such times. Best Northumbrian steam coals are duller at 8s. 6d. per ton f.o.b.; and in one or two cases 8s. 4½d. per ton has been accepted for orders required to keep collieries at work. Second class steam coals are about 8s. per ton; and steam smalls, 3s. 6d. to 3s. 9d. In the gas coal trade, some interest is felt in large local contracts that are now in the market, and which are expected to be entered into at about 6s. 9d. to 7s. per ton f.o.b. The demand for gas coals for local use is now about at its lowest; but the exports are fairly good. For occasional cargoes, the price of Durham gas coals varies from 6s. 6d. to 7s. per ton f.o.b., according to the quality and the position of the producing colliery. There is no alteration this week in the gas coke trade, except that the production has been a little further reduced, and the stocks are lower in some cases.

Scotch Coal Trade.—The coal market has undergone no change. The demand is still good, but prices are not showing any disposition to rise. The prices quoted are: Main, 6s. 3d. to 6s. 6d. per ton f.o.b. Glasgow; ell, 7s. to 7s. 3d.; and splint, 6s. 6d. to 7s. The shipments for the week amounted to 152,157 tons—a decrease of 3510 tons on the preceding week, and of 1376 tons on the corresponding week of last year. For the year to date, the total shipments have amounted to 2,641,252 tons—an increase upon the same period of last year of 94,031 tons.

Opposition at Kingston to the Southwark and Vauxhall Water Bill.—At a special meeting of the Kingston-on-Thames Town Council last Thursday, it was resolved to oppose the Southwark and Vauxhall Water Company's Bill; the chief object being to obtain insertion in the Bill of a clause to give the local authorities more effective control in regard to the disturbance of the roads, and thus bring about the prevention of so much leakage, which necessitates the breaking up of streets, and injures the road material. A public meeting held subsequently endorsed the resolution of the Council.

The Remission of Dues on Exported Coke at Ipswich.—The Ipswich Dock Commissioners have taken the advice of Counsel on the question of remitting the dues on coke exported by the Gas Company, and also as to whether the Commissioners have acted rightly or wrongly in allowing a drawback on coke which, coming into the borough as coal, had been exported in the residual form. The opinion of Counsel (Mr. T. C. Blofeld) is that it was not intended that there should be a remission under the circumstances. He argued that allowing remission on exported coke would be equivalent to an allowance on malt which came in as barley. In both cases the quantity varied.

South Staffordshire Water Company and the Water Supply of Burton-on-Trent.—The success of Mr. Barrow in his test case against the South Staffordshire Water-Works Company (*ante* pp. 843, 891) resulted in a town's meeting being called at Burton-on-Trent last Tuesday to consider the matter. A resolution was passed, thanking Mr. Barrow for the "noble, successful, and independent stand he had made against the South Staffordshire Water-Works Company, the success of which will affect the whole of the charges to the water consumers of the town." Another was agreed to expressing the opinion of the meeting that the Corporation should be asked to protect the interests of the water consumers, and that all possible steps should be taken to acquire the rights of the Water Company. A third was also adopted, urging the desirability of forming a Water Consumers' Association to investigate the powers and charges of the Company.

Burton-on-Trent Corporation Gas Supply.—According to the accounts for the year ending March 31 last of the Burton-on-Trent Gas Department, which, as well as the electric light undertaking of the Corporation, is under the management of Mr. F. L. Ramsden, the sale of gas for ordinary consumption produced £29,056, and for public lighting £4284, as compared with £27,089 and £4183 in the preceding year. Meter and stove rents were rather higher; but coke, tar, and spent lime produced about £400 less, and sulphate of ammonia nearly £500 less. The total revenue, however, was £42,380, against £41,314. With regard to expenditure, coals cost £14,204 and wages £3571; as compared with £15,423 and £3593 in 1895-6; maintenance of works, £2980, against £2966; renewal of retort-house and retorts, £990, against £851; repairs of mains, services, and meters, £691, against £715; meter inspection, &c., £475, against £578; salaries, £1250, against £1124; street lighting, £881, against £891. The total expenditure was £35,652, as compared with £36,947; the profit being £6728, against £4367.

Portsmouth Water Company.—The Directors of this Company, in their report for the half year ending March 31, state that the available balance on the profit and loss account is £18,362, out of which they recommend the payment of the full statutory dividends. This, after the usual deductions, will leave a balance of about £3875 to be carried forward. During the half year 1530 yards of additional service mains were laid in new roads; making a total of upwards of 45 miles of trunk mains and 118 miles of service mains. The number of additional services connected with the mains during the half year was 421; making the total number of premises now served by the Company in all the districts 37,060. The average daily supply during the half year for all purposes was 6,654,000 gallons—a daily increase of 369,000 gallons over the corresponding period of 1895-6. The number of fire hydrants now fixed is 2931. The Engineers (Messrs. Joseph Quick and Son) report that the works and plant, subject to the ordinary repairs in progress, are in good order, and that the springs continue to yield their usual abundant supply. The Directors refer to the retirement of the Secretary (Mr. R. W. Ford), noticed in the "JOURNAL" last week; and they recommend the shareholders to grant him a pension for life of £500 per annum, being the full amount of his present salary.

The Accumulated Profits of the Leeds Corporation Water Committee and the City Rates.—The Water Committee of the Leeds Corporation have voted a grant of £18,000 out of their accumulated profits towards the relief of the rates. This decision was arrived at after hearing an appeal from Alderman Gordon, representing the Finance Committee. He urged that, according to the general law, the profits of the water undertaking ought to go into the city fund. There was a clause in a Local Act, however, that gave the Water Committee the option of accumulating a reserve fund equal in amount to one-twentieth of their capital expenditure. It was, however, left entirely to their discretion as to whether they should exercise this permissive clause. To hand over a portion of the profits of the undertaking would not, said Alderman Gordon, be creating a precedent. Some years ago £80,000 of such profits was devoted to paying off the debt on the Town Hall; and later between 1877 and 1887, £60,000 was placed to the city fund account by the Committee. On the other hand, money had been taken from the city fund to help the Water Department. At different times, £23,000 had been paid in this way to meet deficiences on the water accounts. It was with a view of obviating the necessity of increasing the rates, or in the alternative having a deficiency at the end of the present financial year, that the Finance Committee desired this grant. The proposal was agreed to.

Gas-Works Extensions at Llandudno.—The Llandudno District Council have instructed their Clerk to make application to the Local Government Board for sanction to borrow £3462 for the erection of a new retort house at the works.

The Lowestoft Corporation and the Water and Gas Company.—The threatened opposition of the Lowestoft Corporation to the Bill of the Water and Gas Company has ended in a fizzle. A statutory meeting of the members was called for last Tuesday evening, to take into consideration the expediency of opposing the Bill; but only twelve members put in an appearance, whereas an absolute majority of seventeen was required to pass the resolution. Under the circumstances, the only course open to those present was to agree not to proceed with the opposition. Coming upon the rebuff received by the rejection of their Bill, to be let into this position by their colleagues, after all the talk that has taken place on the subject, must have sent many councillors home with the feeling that the dignity of their corporate body had been somewhat tarnished.

Stafford Corporation Gas Profits.—Alderman Peach reported at the meeting of the Stafford Town Council last Tuesday that the net profit on the gas undertaking during the past year had been £2251; and they proposed to hand over £2250 to the district fund in aid of the rates. As a consequence of their being able to do this, the rate would not be raised this year, as they feared it would. It was mentioned by Mr. Hammond that the question of profit-sharing among the workmen at the gas-works had been under consideration; and a Sub-Committee had been appointed to further consider it and report. He thought this was a move in the right direction, as, wherever the plan had been put into operation, it had proved a success. He also pointed out that the Committee had anticipated all the provisions of the Employers' Liability Bill now before Parliament in providing for their workmen in case of accidents. The report was adopted.

The St. Mary Church Gas-Works.—At the last meeting of the St. Mary Church District Council, the Gas Manager (Mr. T. Evans) submitted his annual report. It showed that in the year ending the 25th of March, 19,459,600 cubic feet of gas were made, of which upwards of 15,000,000 cubic feet were sold—an increase on the previous year of 1,500,000 cubic feet. The higher consumption was accounted for in part by the public lamps being lighted each night throughout the year; but it was also due to an increase of ordinary consumption, and to a larger number of prepayment meters being fixed. The fall in the price of residuals had, however, told adversely upon the revenue account. Coke had been 2s. per ton cheaper than in 1895-6, the effect of which was a loss of £70; while the price of sulphate of ammonia was lower by several pounds per ton than he had ever known it. He had only made sufficient to keep down the quantity of ammoniacal liquor, and had offered none for sale, in the hope that the price would improve. Mr. Grant, the Chairman of the Lighting Committee, said the increased demand for gas showed that they were turning out a good article, which the public appreciated. He hoped they would be able to reduce the price. The success of the prepayment meters was one of the most satisfactory features of the year's working. Mr. Evans, he added, deserved their thanks for the manner in which he had performed his duties.

Gas Cookery Lectures at Dublin.—A series of cookery lectures, illustrating the advantages of cooking by means of gas-ranges, is being delivered in Dublin in connection with the Gas Company. Two lady lecturers have been engaged—Miss Richmond and Miss Stansfield. The demonstrations (which will be continued to next Friday) were started last Tuesday, on which occasion the Manager of the stove department (Mr. W. J. Sugg) gave a few interesting details in connection with the general management of the gas cooker.

The Proposed Purchase of the Budleigh Salterton Gas-Works.—A new and important stage has been reached in the negotiations of the Budleigh Salterton District Council for the purchase of the local gas undertaking. The Gas Company have hitherto insisted that the only basis upon which it was possible for them to negotiate for the sale of their works was that they should be treated as a statutory Company. The Council objected; and the Company have now decided not to press this condition. A letter from the Secretary, communicating the decision, was read at a meeting of the Council last Tuesday. It also suggested that the Clerk to the Council should meet two of the Directors to settle preliminaries. The Council agreed to the suggested interview, and instructed the Clerk to afterwards prepare a draft agreement and submit it to the next meeting of the Council, in order that it may be discussed before any further step is taken.

The Market Harborough Gas Company's Provisional Order.—A meeting of owners and ratepayers was held at Market Harborough last Wednesday, for the purpose of consenting or otherwise to the opposition of the District Council to the Provisional Order for which application has been made by the Gas Company. The Clerk to the Council (Mr. Rawlins) stated that the Company was constituted in 1833, with an authorized capital of £3300. Being a private concern, they had no legal right to use the thoroughfares for their business. But so far as he knew, this permission had been freely conceded by the Local Authorities; and there had been no suggestion that the powers given in the past would be withdrawn. The Company was a private one until 1856, when it was converted into an unlimited liability Company. This went on until last year, when it was converted into a limited liability Company—this being done in order to obtain a Provisional Order from the Board of Trade. The undertaking had been a very remunerative one. It began by paying 2½ per cent.; and this quickly rose to 4, 5, and 6 per cent. In 1896, £3300 more share capital was raised—making £6600 in all. In the Provisional Order, the capital was put down at £19,800; this larger amount having been practically taken out of the pockets of the consumers. A meeting had been held at the offices of the Board of Trade between representatives of the Company and the Council to try and arrange matters; and the rate of interest the Company claimed was then reduced from 10 to 5½ per cent. The maximum price at which gas should be supplied was very much reduced by the Board of Trade, and a sliding-scale was introduced. If they allowed the Bill to pass without opposition, it would give the Company a monopoly for all time. The Council also wanted a purchase clause inserted in the Bill; but this they had not been able to obtain. The action of the Council in opposing the Bill was confirmed.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST (see ante, p. 1184).

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.			£ s. d.
590,000	10	9 Apl.	10½	Alliance & Dublin 10 p. c.	23–25	..	4 4 0
100,000	10	,,	7½	Do. 7 p. c.	17½–18½	..	4 1 1
300,000	100	2 Jan.	5	Australian (Sydney) 5 % Deb.	108–111	..	4 10 11
200,000	10	29 Oct.	7†	Belgrano (B. Ayres), Limited	10–10⅜	+⅛	6 13 4
100,000	Stck.	30 Dec.	5	Do. 5 p. c. Deb. Stk	102–105	..	4 15 3
200,000	5	12 Nov.	6½	Bombay, Limited	6½–7½	..	4 6 8
40,000	5	,,	6½	Do. New, £4 paid	5–6	..	4 6 8
380,000	Stck.	26 Feb.	12	Brentford Consolidated	287–292	..	4 2 2
240,000	,,	,,	9	Do. New	223–228	..	3 18 7
50,000	,,	,,	5	Do. 5 p. c. Pref.	145–150	..	3 6 8
159,375	,,	11 Dec.	4	Do. 4 p. c. Deb. Stock.	130–134	..	2 19 9
220,000	Stck.	25 Mar.	11½	Brighton & Hove Original	273–278	..	4 2 8
208,820	,,	,,	8½	Do. A Ord. Stk.	197–202	..	4 4 2
933,500	Stck.	26 Feb.	5	Bristol, 5 p.c. max.	130–135	..	3 14 1
420,000	20	26 Mar.	11½	British	56–57	..	3 18 11
50,000	10	26 Feb.	11½	Bromley, Ordinary 10 p. c.	23–25	..	4 12 0
71,000	10	,,	8½	Do. 7 p. c.	18–20	..	4 5 0
500,000	10	28 Apl.	6	Buenos Ayres (New) Limited	9½–10	..	6 0 0
200,000	100	2 Jan.	6	Do. 6 p. c. Deb.	101–103	..	5 16 6
150,000	20	26 Feb.	8½	Cagliari, Limited	30–32	..	5 3 1
100,000	10	30 Sept.	8½	Cape Town & District, Ltd	17–18	..	4 8 11
50,000	50	3 May	6	Do. 6 p. c. 1st Mort.	57–59	..	5 1 8
550,000	Stck.	9 Apl.	13½	Commercial Old Stock	350–355	+2	3 16 0
165,000	,,	,,	10½	Do. New do.	265–270	+8	3 17 9
165,000	,,	11 Dec.	4½	Do. 4½ p. c. Deb. do.	150–155	..	2 18 0
800,000	Stck.	30 Dec.	13	Continental Union, Limited.	255–260	..	5 0 0
200,000	,,	,,	10	Do. 7 p. c. Pref.	215–220	..	4 10 11
51,600	Stck.	26 Feb.	14	Croydon Com'cial A 10 p. c.	317–322	..	4 6 11
163,400	,,	,,	11	Do. B 7 p. c.	255–260	..	4 4 7
535,000	Stck.	26 Feb.	5½	Crystal Palace Ord. 5 p. c. Stk	139–142	..	3 13 11
60,000	,,	,,	5	Do. 5 p. c. Pref.	140–143	..	3 9 11
486,090	10	29 Jan.	11	European, Limited	24½–25½	..	4 6 3
354,060	10	,,	11	Do. £7 10s. paid	17½–18½	..	4 9 3
5,836,590	Stck.	12 Feb.	12¾	Gaslight & Coke, A, Ordinary	311–316	..	4 0 8
100,000	,,	,,	4	Do. B, 4 p. c. max.	112–117	..	3 8 5
665,000	,,	,,	10	Do. C, D, & E, 10 p.c. Pf.	312–317	+2	3 3 1
30,000	,,	,,	5	Do. F, 5 p. c. Prf.	150–155	..	3 4 6
60,000	,,	,,	7½	Do. G, 7½ p. c. do.	220–225	..	3 6 8
1,300,000	,,	,,	7	Do. H, 7 p. c. max.	207–212	..	3 6 0
463,000	,,	,,	10	Do. J, 10 p. c. Prf.	312–317	+2	3 3 1
476,000	,,	,,	6	Do. K, 6 p. c. Prf.	182–187	..	3 4 2
1,061,150	,,	11 Dec.	4	Do. 4 p. c. Deb. Stk.	140–143	+2	2 15 11
294,850	,,	,,	4½	Do. 4½ p. c. do.	152–157	+2	2 17 4
908,000	,,	,,	6	Do. 6 p. c. do.	207–212	..	2 16 7
70,000	10	13 May	6	Hongkong & China, Limited	13–14*	..	4 5 10
3,800,000	Stck.	13 May	10	Imperial Continental	212–217*	..	4 12 2
376,400	100	1 Feb.	4	Do. 4 p. c. Debs. Red.	100–103	..	3 17 8
473,600	Stck.	12 Feb.	3½	Do. 3½ p. c. Deb. Stk	104–107	..	3 5 5
75,000	5	11 Dec.	6	Malta & Mediterranean, Ltd.	5⅞–6⅞	..	4 16 2
560,000	100	1 Apl.	5	Met. of Melbourne, 5 p. c. Deb.	111–113	..	4 8 6
250,000	100	,,	4½	Do. 4½ p. c. Debs.	107–109	..	4 2 7
541,920	20	12 Nov.	5	Monte Video, Limited	14½–15½	..	6 9 0
150,000	5	26 Nov.	8	Oriental, Limited	8½–9	..	4 8 11
135,000	5	,,	8	Do. New, £4 10s. paid	7⅞–8	..	4 10 0
15,000	5	,,	8	Do. do. 1879, £1 paid	1¾–2	..	4 0 0
60,000	5	26 Mar.	7	Ottoman, Limited	5–5½	..	6 7 3
420,000	100	3 May	6	People's Gas } 1st Mtg. Bds.	104–109	+3	5 10 1
500,000	100	1 Dec.	6	of Chicago } 2nd Do.	107–112	+3	5 7 1
250,000	10	30 Sept.	10	San Paulo, Limited	14½–15½	+½	6 9 0
5,475,000	Stck.	26 Feb.	5½	South Metrop., 4 p.c. Ord.	141–144	..	3 12 11
1,416,667	,,	—	3	Do. 3 p.c. Deb. Stk.	106–108	..	2 15 7
60,000	Stck.	12 Mar.	11½	Tottenham & Edmonton, A	275–285	..	4 0 10
60,000	,,	,,	8½	Do. B	190–200	..	4 5 0
182,380	10	30 Dec.	10	Tuscan, Limited	14–15	..	6 13 4
149,900	10	2 Jan.	5	Do. 5 p. c. Debs. Red.	101–103	..	4 17 1
				WATER COMPANIES.			
746,159	Stck.	30 Dec.	10½	Chelsea, Ordinary	327–332	..	3 3 3
150,000	,,	,,	5	Do. 5 p. c. Pref.	175–180	..	2 15 6
160,000	,,	,,	4½	Do. 4½ p. c. Pref. Stk., 1875	158–162	..	2 15 6
175,785	,,	26 Mar.	4½	Do. 4½ p. c. Deb. Stock	160–165	..	2 14 6
1,720,563	Stck.	9 Apl.	7	East London, Ordinary	221–225	..	3 2 9
654,740	,,	30 Dec.	4½	Do. 4½ p. c. Deb. Stk.	164–169	..	2 13 4
390,000	,,	,,	3	Do. 3 p. c. Deb. Stk.	107–109	..	2 15 0
700,000	50	11 Dec.	7½	Grand Junction, 10 p.c. max.	118–123	+3	3 1 0
295,000	Stck.	26 Mar.	4	Do. 4 p. c. Deb. Stk.	148–153	..	2 12 4
708,000	Stck.	12 Feb.	12	Kent	342–347	+2	3 9 2
160,000	,,	,,	7	Do. New, 7 p. c. max.	212–217	..	3 4 6
1,043,800	100	30 Dec.	9½†	Lambeth, 10 p. c. max.	280–285	+3	3 8 5
406,200	100	,,	7½	Do. 7½ p. c. max.	220–225	..	3 6 8
350,000	Stck.	26 Mar.	4	Do. 4 p. c. Deb. Stk.	147–150	..	2 13 4
500,000	100	12 Feb.	13	New River, New Shares.	422–427	+2	3 0 10
1,000,000	Stck.	29 Jan.	4	Do. 4 p. c. Deb. Stk.	152–155	..	2 11 7
902,300	Stck.	30 Dec.	6	S'thwk & V'xhall, Ordinary	155–160	..	3 15 0
126,500	100	,,	6	Do. Do. 7½ p. c. Max.	150–155	..	3 17 5
489,200	Stck.	,,	5	Do. Do. 5 p. c. Pref.	175–180	..	2 15 7
1,019,585	,,	9 Apl.	4	Do. 4 p. c. A Deb. Stk.	145–148	..	2 14 2
1,155,066	Stck.	11 Dec.	10	West Middlesex	310–315	..	3 3 6
200,000	,,	,,	4½	Do. 4½ p. c. Deb. Stk.	163–168	..	2 13 7

† Next Dividend will be at this rate. *Ex div.

The Water-Gas Question at Stockport.—The Stockport Trades Council have decided to send a protest to the Local Government Board against the Stockport Corporation making and distributing water gas.

Proposed Purchase of the Clacton-on-Sea Water-Works.—The Clacton-on-Sea District Council have passed a resolution giving notice, under sections 52 and 53 of the Public Health Act, requiring the Water Company to provide a sufficient supply of water for the reasonable purposes of the district, and expressing the willingness of the Council to purchase the undertaking at a fair price, to be agreed upon between the Council and the Company, or to be settled by arbitration.

A Joint Water Scheme for Whaley Bridge District.—Last Wednesday, a meeting of delegates from the local authorities of Whaley Bridge, Chapel-en-le-Frith, New Mills, and Disley was held at Whaley Bridge for the purpose of taking into consideration a proposed scheme for the supply of portions of the districts with water from the Taxal valley. Mr. Toler, on behalf of Colonel Cotton-Jodrell, M.P., announced that the Colonel would convey the water-rights free of charge, and would also convey free of cost any area of land that might be required for the construction of reservoirs. Messrs. Stirling and Swann, engineers, Chapel-en-le-Frith, were instructed to prepare a report on the scheme; and a vote of thanks was passed to Colonel Jodrell for his generosity.

The Solicitation of Subscriptions to Beanfeasts.—As this is the season of the year when the large wholesale manufacturing houses are usually pestered with solicitations from the employees of their customers for subscriptions towards defraying the expenses of the workmen's summer outings, perhaps the experience of, and the comments upon, this reprehensible system by one of the leading houses connected with the manufacture of gas appliances may be interesting. "Many stamps and much time," they remark, "are expended on the applications to us for subscriptions. Independently of the favouritism and blackmailing entailed, it would be obviously unfair to pay to any part of our customers' beanfeasts, without dividing equally among them all. We have some 14,000 customers on our books; and at a small estimate these will employ an average of ten men each. A subscription of 2s. per man would be about the smallest sum which could be offered. without a suspicion of meanness; and this small amount would absorb more than our total dividends—converting us into a moribund concern. We have had repeated and urgent requests for subscriptions from employees of firms who have not purchased £5 worth of goods from us in twelve months; and it is time that all employers should absolutely prohibit such applications. A new departure has cropped up this season; the employers themselves asking for subscriptions to their yearly excursions and treats to their men. Verily, begging is becoming an art in which impudence predominates." This firm, we know, undertake themselves the entire expenses connected with the entertainment of their workmen; and we hear of another firm who provide an annual dinner for the whole of their employees, but on condition that they neither solicit nor receive contributions of any kind from any firm with whom they may have business dealings. If such a plan were adopted more generally, it would be to the interest of the trade.

Wantage Gas-Works Accounts.—The annual report of the Gas Committee of the Wantage District Council has been published. In their opinion, it is of a most satisfactory nature; the profits of the year having exceeded their expectations. This was chiefly brought about by two items—the first being a less amount of general expenditure than usual; and the second, the sale of 444,000 cubic feet of gas over the previous year. The expenditure under various headings was £1351; and the income, £1935—leaving a gross profit balance of £584.

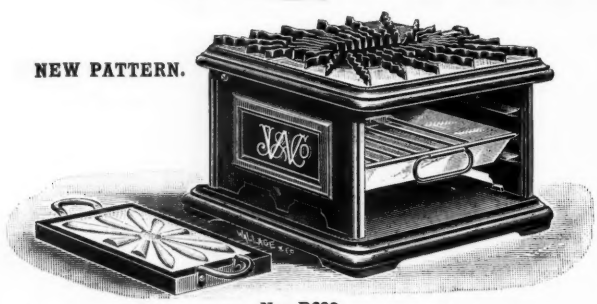
Borrowing Powers of the Halifax Corporation Water Department.—Some time since, Major-General Crouzier conducted an inquiry at Halifax, on behalf of the Local Government Board, with reference to an application by the Town Council to borrow £25,000 for water-works purposes. A letter has been received from the Board stating that they can only approve of a loan of £15,540. They add: "It is not the usual practice of the Board to approve of the borrowing of money in respect of anticipated expenditure during a longer period than three years." They have limited their approval accordingly.

The Welsh Water Supply for Birmingham.—Yesterday week, at Mason College, Birmingham, Mr. Antony Lees, Secretary to the Corporation Water Department, delivered an address on the Elan Valley Water-Works. He first gave a general idea of the whole scheme, which originated in the report of Mr. James Mansergh to the Water Committee in January, 1891. Illustrations were shown of Rhayader, as well as of a model of the watershed of the Rivers Elan and Claerwen. The whole rain of the watershed was, he said, collected by the system of tributaries into one stream; and the waters were to be retained by means of an embankment or dam built across the stream. Mr. Lees spoke of the suitability of the site in relation to its water-yielding capacity, the purity of the water, the elevation in relation to the area to be supplied, and as to affording convenient points at which to erect embankments or dams for the formation of impounding reservoirs. The total area of the watershed was above 45,000 acres; and the rainfall had averaged, during the last three years, upwards of 60 inches. As to the works, these comprised reservoir dams and other works on the watershed, an aqueduct, and receiving and distributing systems at the Birmingham end. He sketched the line of the aqueduct from the entering point to the delivery reservoir at Frankley, and said the distance between the two places was 73 miles. There would be nine tunnels in all, with a length of 13½ miles; seventeen sections of cut-and-cover, with a total length of 23 miles; and eleven sections of syphon or pipe-line, with a length of 37 miles. Having described the scheme, and given a general idea of the works required to bring the water of the Elan and Claerwen to the city, Mr. Lees went on to speak of the gigantic reservoirs now constructing in the Elan Valley. The work was being carried out by the Corporation by the direct employment of labour, without the intervention of a contractor. They had a series of works extending over practically ten miles of country, and to occupy from eight to ten years in construction, affording at the present time constant employment for 1200 to 1500 men—shortly to be increased to 2000.

WRIGHT'S RAPID GAS-GRILLERS

Suitable for use with PREPAYMENT METERS.

NEW PATTERN.



No. B632.

No.	Outside Dimensions.			Price complete with Pan and Grid and Special Deflector.
	Width.	Depth.	Height.	
B632	11	11	7½	12s. 0d.

This Griller is very strong; and there are no working parts to get out of repair. **Admirably adapted for letting out on hire.**

No. B628.

No.	Outside Dimensions.			Price complete with Pan and Grid.
	Width.	Depth.	Height.	
B628	12	8½	6½	6s. 6d.
B629	12	8½	6½	6s. 6d.

This Broiler is made entirely of **Cast Iron**, and is fitted with a very powerful Burner. Will cook two Chops, and boil a Kettle at the same time.

JOHN WRIGHT & CO., LTD., BIRMINGHAM and LONDON.

Gas Exhibition at Chesterfield.—Last Wednesday, Mr. John Hall, the Chairman of the Chesterfield Gas and Water Board, opened an exhibition of gas appliances in the Market Hall. The exhibition is to remain open till the 29th inst., and will include a series of cookery lectures by Miss F. E. Chester, of Nottingham.

The Management of Incandescent Gas Lighting.—At a meeting of the Lambeth Guardians last Thursday, the cost of maintaining the incandescent system of gas lighting was criticized; and a letter was read from the Incandescent Gas-Light Company suggesting that one of the officials should be properly instructed how to deal with the mantles—the Company being quite willing to arrange for giving the lessons. It was agreed that an officer should be instructed as suggested. One of the Guardians remarked that the light was good, and the consumption of gas reduced; but the want of proper knowledge as to handling and managing the mantles made the system very costly. This would not be the case if an official understood the principle of the system, instead of trusting to mere "rule-of-thumb."

Extension of the Stourbridge Gas-Works.—Last Tuesday a Local Government inquiry was held by Colonel Durnford, R.E., touching an application by the Stourbridge District Council to borrow £10,000 for outlay connected with the gas undertaking. The Clerk to the Council (Mr. W. W. Goddard) stated the purpose of the application, and the Gas Engineer (Mr. W. North) gave an estimate of the anticipated expenditure on the gas undertaking for the next three years, which the present loan of £10,000 was designed to cover. Speaking of prepayment meters, Mr. North stated that more than 1700 had been fixed in three-and-a-half years; and he anticipated their use would go on extending at the rate of 450 a year. He described the extension of plant, &c., necessary in consequence of the increased consumption. Last year the additional consumption amounted to 14 million cubic feet; and they sold 12½ million cubic feet last year through these meters. Mr. Walter Jones, the Chairman of the Council, stated that the audited accounts of the gas undertaking last year showed a total profit of £7429; and after deducting all charges for interest, repayment of principal, depreciation, &c., it left a net credit balance of £1039.

Messrs. S. Cutler and Sons have lately completed for the Crays Gas Company a gasholder having a capacity of about a quarter of a million cubic feet.

Messrs. W. Parkinson and Co. held a very successful gas exhibition from Tuesday to Friday last week at Atherstone. Miss Edith Sanderson gave practical demonstrations on cookery twice daily.

The Anti-Vibration Incandescent Lighting Company, Limited, of Bradford, have just fitted the offices of the Birmingham "Argus" with their anti-vibration frames, and have also supplied upwards of 1000 frames to the Midland Railway Company at Derby.

Messrs. R. Dempster and Sons, Limited, of Elland, have secured the order for the recently advertised gasholder extension for the North Shields Gas Company, which consists of adding a third lift to a holder 105 feet in diameter and 30 feet deep. The new lift is arranged so as to leave the guide-framing when inflated.

The Longton (Staffs) Corporation Gas Committee have accepted the tender of West's Gas Improvement Company, Limited, of Manchester, for the supply and erection of their charging and drawing machinery. The Chorley Corporation Gas Committee have also decided to adopt West's machinery, including coal breaking, elevating, and conveying plant in connection therewith.

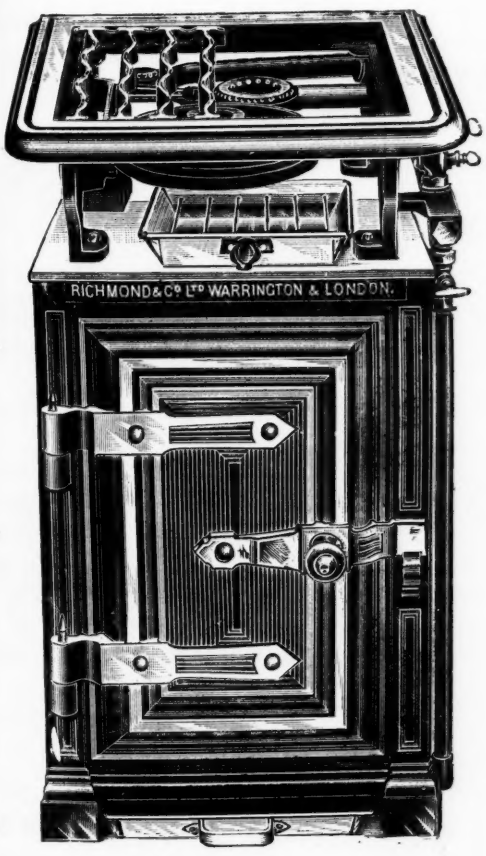
Messrs. R. & A. Main held an exhibition of their appliances in the Literary Institute, Edinburgh, last week. It was opened on Monday by Mr. W. R. Herring, Engineer to the Gas Commission, who announced that, in order to encourage the use of gas for cooking and heating, the Gas Commissioners had resolved to fit up gas appliances free of charge. Miss Griggs, of Edinburgh, was the lecturer.

The sale which Mr. Alfred Richards will conduct at the Mart, Tokenhouse Yard, E.C., on the 26th inst., will include 500 £10 "C" shares in the Harrow and Stanmore Gas Company, and a similar number of £10 shares in the Southend Water Company. These shares are being issued by order of the Directors of the Companies. Stocks and shares in the Wandsworth and Putney, Hornsey, Tonbridge, Brentford, and Barnet Companies, will also be offered.

By an announcement which appears in our advertisement columns, it will be seen that the Cranbrook District Water Company, which was incorporated by an Act obtained about two years ago, are inviting tenders for 15,000 ordinary shares of £1 each, ranking for dividend up to 10 per cent. The minimum price of issue is par. It is stated that, pending the completion of the works, 3½ per cent. dividend will be guaranteed for two years. The population of the district to be served is 10,000; and the rateable value, £46,430.

By the combined efforts of Messrs. Best and Lloyd, Messrs. George Bray and Co., Messrs. Chesterton and Son, Messrs. Hill and Smith, Messrs. Lloyd and Lloyd, Messrs. W. Parkinson and Co., Messrs. J. Wright and Co., and the Manager of the Brierley Hill and District Gas Company's works at Kingswinford (Mr. Jones), a very attractive gas exhibition was held at the Caxton Hall in that town in the week ending the 15th inst. The Chairman of the Company (Mr. W. H. Westwood) opened the exhibition, and added to its interest by showing a gas-stove which he has had in use for nearly fifty years. Miss Ball gave cookery demonstrations twice daily.

At a recent meeting of the Ipswich Corporation, the tender of Messrs. Simpson and Co., of Pimlico, was accepted for a new pumping-engine and boiler for the water-works. The engine is to be a horizontal triple expansion one, of the Worthington type; and the steel boiler is to stand a working pressure of 120 lbs. per square inch. The engine will be almost a duplicate of the one erected at the water-works by the above-named firm in 1894, which has proved very satisfactory; and it is to be capable of lifting 2 million gallons of water per day. The tenders were sent in to the specification of the Water-Works Manager (Mr. Hamlet Roberts); and the work is to be carried out under his supervision.



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KING-OF-THE-SLOTS

"K-O-S."

FITTED WITH LOOSE BURNERS FOR CLEANING, &c., AND WHITE ENAMELLED CROWN PLATE.

No. 128 - - - - - 65/-

GWYNNE & BEALE'S

PATENT GAS EXHAUSTERS AND ENGINES.

Telegrams: "GWYNNEGRAM, LONDON." Telephone No. 65,095.

GWYNNE & CO.,

HYDRAULIC AND GAS ENGINEERS,

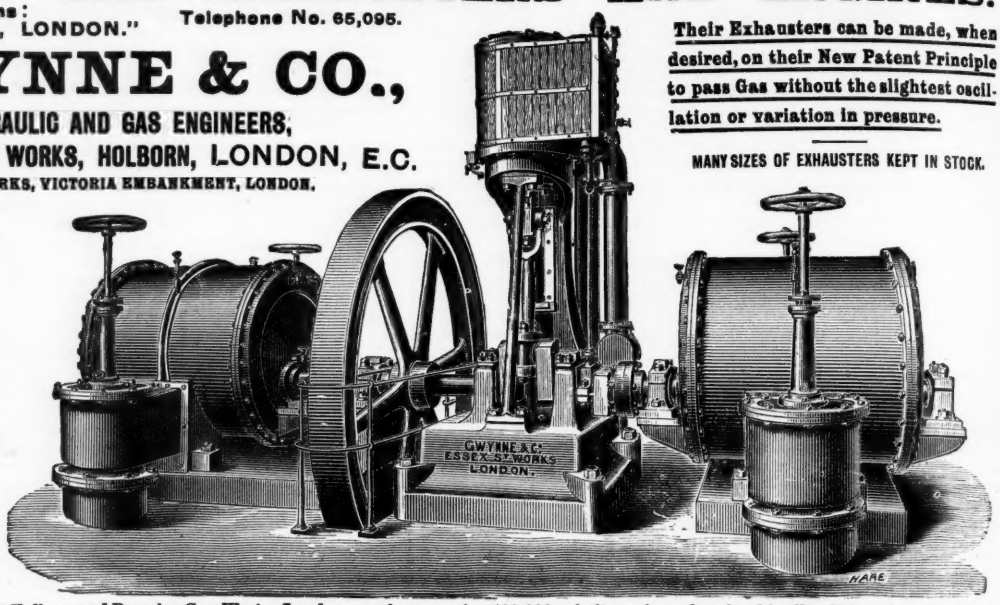
BROOKE STREET WORKS, HOLBORN, LONDON, E.C.

Late ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON.

They have completed Exhausters to the extent of 32,000,000 cubic feet passed per hour, which are giving unqualified satisfaction in work.

Makers of GAS-VALVES HYDRAULIC REGULATORS VACUUM GOVERNORS, PATENT RETORT-LIDS, STEAM-PUMPS for Tar, Liquor, or Water; CENTRIFUGAL PUMPS and PUMPING ENGINES, specially adapted for Water-Works, raising Sewage, &c.

Also GIRARD and other TURBINES, HIGH SPEED ENGINES, DYNAMOS, &c., &c., for ELECTRIC LIGHTING.



Their Exhausters can be made, when desired, on their New Patent Principle to pass Gas without the slightest oscillation or variation in pressure.

MANY SIZES OF EXHAUSTERS KEPT IN STOCK.

Exhausting Machinery at Fulham and Bromley Gas-Works, London—each set passing 400,000 cub. ft. per hour drawing 14 miles distant from Beckton.

Catalogues and Testimonials sent on application.

NOTICE TO ADVERTISERS.—COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office *not later* than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of PERMANENT ADVERTISEMENTS, should be received not later than the FIRST POST on SATURDAY.

GAS PURIFICATION AND CHEMICAL COMPANY, LIMITED.

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O'NEILL'S Oxide has a larger annual sale in the United Kingdom than all other Oxides combined. Purity and uniformity of quality guaranteed. Pamphlet, "How to Purchase Bog Ore," to be obtained on application.

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WINKELMANN'S "VOLCANIC" CEMENT. Fire Resistance up to 4500° Fahr. In use in most Continental Gas-Works, and in more than 300 British Gas-Works.

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SULPHURIC ACID for Sale. BROTHERTON AND CO., Chemical Manufacturers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

BROTHERTON & CO. Offices: Commercial Buildings, LEEDS. Correspondence invited.

JOHN RILEY & SONS, Chemical Manufacturers, Hapton, near Accrington, are MAKERS of SULPHURIC ACID, from Brimstone, for Sulphate of Ammonia making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol. References given to Gas Companies.

HYDRATED OXIDE OF IRON.

PREPARED from pure Iron.
Two or three times as rich as Bog Ore.
Strong action on Sulphuretted Hydrogen.
To be used alone, but will increase activity of other Oxides.
Less than half the price of Bog Ore.
Can be lent on hire.
Write for tabulated results.

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J. & J. BRADDOCK, Globe Meter Works, Oldham.
First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.
Telegraphic Address: "Braddock Oldham."

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Limited, Chemical Works, Leeds, specially produce this ACID from SULPHUR, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Wagons or Carboys. Highest references and all particulars supplied on application.

PORTER & CO., Gowts Bridge Works, LINCOLN, Engineers, Ironfounders, and Contractors for the erection of Gas-Works for Towns, Villages, Mansions, Manufactories, Collieries, and Isolated Buildings at home and abroad. Manufacturers of Retorts and Fittings, Condensers, Scrubbers, Purifiers, Valves, &c.; also of Girders, Wrought and Cast Iron Tanks, Iron Roofs, &c.
Telegraphic Address: "PORTER LINCOLN."
[For Illustrated Advertisement, see May 4, p. 1020.]

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INCREASE the Efficiency of your PURIFIERS by adopting CRIPPS'S PATENT BYE-PASS VALVE in the lower Tiers of Sieves. Practical Experience proves their Economy. Engineers are repeating orders after thorough trial.
References and Particulars can be obtained from the Makers—
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SON of Manager (age 30) seeks a Situation as GAS-FITTER. Well up in Iron and Compo. work, fixing Meters, Cookers, and Fires, Main and Service laying, Incandescent Street Lighting, and the general routine of a Gas-Works. Good References if required.
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MAIN and Service Layer wanted.
Applications, stating Age and Wages required, to be addressed to the SECRETARY and GENERAL MANAGER, Enfield Gas Company, Enfield, MIDDLESEX.

THE Engineer of a large Gas-Works, with exceptional advantages, has a vacancy for a PUPIL.
Apply, by letter, to No. 2833, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

A FIRM of Contracting Gas Engineers wish to engage a gentleman to REPRESENT them. Applicants must be thoroughly conversant with details of Gas Apparatus, to enable them to advise and take Dimensions when required.
State Age, Experience, and Salary, to No. 2835, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

TO GAS-FITTERS.

WANTED, at once, a Gas-Fitter capable of laying Mains and Service-Pipes and Inspecting Meters.
Apply, stating Age and Wages required and enclosing *copies* of Testimonials (which will not be returned), to T. LAYTON, Manager, Gas-Works, REDDITCH.

WANTED, a good Draughtsman in a Gas Engineer's Office. Capable of getting out Working Drawings for all kinds of Gas-Works Buildings and Plant. Must have had Six or Seven Years' good Experience as a Draughtsman. First-Class Testimonials absolutely necessary. Wages 35s. a week.
Apply, by letter, to No. 2853, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

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WANTED, a thoroughly competent DRAUGHTSMAN in a large Gas-Works in Scotland. One accustomed to structural Ironwork and Gas-Works Plant. Quick at detailed Drawings, and the estimation of quantities. Salary, £2 per week.
Apply, by letter, stating Age and Experience, enclosing not more than three *copies* of recent Testimonials, to No. 2851, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

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THE Directors of this Company are prepared to receive APPLICATIONS for the post of RESIDENT ENGINEER and MANAGER. Commencing Salary, £200.
Candidates must possess full qualifications, and have responsible experience in Gas-Works Management, comprising modern Purification, Treatment of Residuals, and the supply of Stoves and Fittings by Prepayment Meters, &c.
Testimonials, with statement of Age, and whether Married or Single, to be forwarded to the CHAIRMAN, Gas Company's Office, UXBRIDGE.

COUNTY BOROUGH OF SALFORD.
(GAS DEPARTMENT.)

THE Gas Committee are prepared to receive APPLICATIONS for the appointment of SUPERINTENDENT of their Regent Road Works.
Salary to be £250 per annum.
Applicants to state Age and Experience, and send not more than three *copies* of recent Testimonials addressed to the Chairman of the Gas Committee, Town Hall, Salford, before Five p.m., on June 3, 1897.
SAML. BROWN,
Town Clerk.
Town Hall, Salford,
May 22, 1897.

LEIGH URBAN DISTRICT COUNCIL.

APPOINTMENT OF GAS ENGINEER AND MANAGER.

THE Leigh Urban District Council invite APPLICATIONS from qualified persons for the appointment of GAS ENGINEER and MANAGER of their Works.
Candidates must not be less than 30, nor more than 45 years of age.
The Salary will be £300 per annum, payable quarterly; and the person appointed will be required to devote the whole of his time to the Duties of the office, and the engagement will be determinable on three calendar months' notice from any date.
Printed forms, upon which application must be made, can be obtained at my Office, or will be sent upon receipt of a stamped addressed foolscap envelope.
Applications, accompanied by *copies* (which will not be returned) of not more than three Testimonials of recent date, must reach me not later than May 29, 1897, endorsed "Gas Engineer and Manager."
By order,
GEO. DICKINSON,
Clerk to the Council.
Town Hall, Leigh, Lancs.,
May 5, 1897.

CONTRACTOR requires a good leading DRAUGHTSMAN, accustomed to designing and detailing Gas Apparatus or Retort-Settings.
Apply, stating Age, Experience, and Salary required, to No. 2854, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GAS CARBON Wanted, not less than 4-Ton Loads.
Apply to the BRIMINGTON CARBON COMPANY, Sowerby Bridge, YORKS.

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WANTED, Offers of Benzols—50 per cent. and 90 per cent.
Address No. 2852, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

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STORAGE Tanks for Tar and Liquor.
Several Wrought and Cast Iron ones up to 275,000 gallons capacity FOR DISPOSAL cheap.
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FOR SALE—A Station Meter complete, in thorough working order. Recently overhauled and certified correct by Messrs. Braddock. Capacity, 50,000 feet per hour.
Apply to JOHN H. DARBY, Brymbo, near WREXHAM.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also COMPLETE WORKS equal to 7000, 20,000, 60,000 cubic feet per diem. **Inquire and compare Prices and Particulars before ordering elsewhere.**
J. F. BLAKELEY, Gas Engineer, Ravensthorpe, YORKS.

FOR SALE, cheap—
One TELESCOPIC GASHOLDER, 32 ft. diameter, with two lifts 14 ft. deep each; Capacity, 23,500 cubic feet, with Wrought-Iron Tank complete.
One CAST-IRON SCRUBBER, 38 ft. 6 in. by 6 ft. diameter.
Two PURIFIERS, 8 feet square, complete, with 6-inch Bye-Pass Valves and Connections.
EXHAUSTERS, 5000 to 60,000 cubic feet per hour.
We would undertake to re-erect any of the above, if desired.
Photos, Particulars, and Prices of above on application to SAML. WHILE AND SONS, 60, Queen Victoria Street, LONDON, E.C.

COMPLETE GAS PLANT FOR SALE.

TO BE SOLD separately, or in one lot—
Two Double-Lift HOLDERS, 34 ft. 4 in. diameter outer, 32 ft. 10 in. inner, 14 ft. 3 in. deep, with Pipes, &c.
One GOVERNOR, SYPHON-BOXES, VALVES, &c.
One STATION METER, with Valves (new), Braddock's make.
One Set of four PURIFIERS, 7 ft. square by 4 ft. deep, Walker's make, with Grids and one of their Centre-Valves, Connections, and Lifting Gear.
One TAR-PUMP and STORE BOILER.
One "ECLIPSE" WASHER-SCRUBBER, Laycock and Clapham, with Pulleys and Governor, erected in 1890.
One EXHAUSTER, with 12-inch Valves and Connections.
One Horizontal CONDENSER, with fourteen 8-inch Pipes, 18 ft. long, with Bye-Pass, Valves, and Connections.
Twenty RETORT MOUTHPIECES, with Lids and Duplicates, Dip, Ascension, and Bridge Pipes, Hydraulic Main and Valve, Fire-Doors, Buckstaves, and Tie-Rods.
12-inch and 8-inch MAINS, at per ton.
12-inch VALVES, at each.
For further Particulars and Prices, apply to H. I. WILLIAMS AND CO., Kidsgrove, STOKE-ON-TRENT.

UXBRIDGE AND HILLINGDON GAS CONSUMERS' COMPANY.

GAS COAL.

THE Directors of the above Company invite TENDERS for the supply of 3500 Tons of GAS COAL, deliveries of which are to commence the first week of July, 1897, and finish the last week of May, 1898.
Tenders to be made out for 1000 Tons of best South Yorkshire unscreened Silkstone Gas Coal, delivered in Trucks (free) at Uxbridge Railway Station, G.W.R., each Ton to contain 20 cwt., and 2500 Tons of the best description of unscreened Gas Coal from the Durham Coal-Fields delivered by Barge (free) alongside the Company's Works, Grand Junction Canal.
Tenders are to state the Names of the Pits from which the above description of Coal will be supplied, the same to be fresh wrought, and free from Slate and other Impurities, and to the entire satisfaction of the Company's Engineer.
Deliveries to be according to the requirements of the Company.
Tenders to be received on or before the 3rd day of June next, addressed to the Chairman, Gas Company's Office, Uxbridge, Middlesex, and endorsed "Tender for Coal."
A Form of Tender will be sent on application.
W. & W. M. GARDINER,
Secretaries.
Uxbridge, Middlesex,
May 15, 1897.

CITY OF CARLISLE.

THE Carlisle Gas Committee are prepared to receive TENDERS for the COAL and CANNEL required at their Works during One Year from the 1st of July next.
Tenders to be delivered to the undersigned not later than May 31, 1897.
Forms of Tender and other Particulars on application.
C. B. NEWTON,
Engineer and General Manager.
Gas-Works, Carlisle,
May 15, 1897.

CITY OF CARLISLE.

THE Carlisle Gas Committee are prepared to receive TENDERS for the surplus TAR produced at their Works for a period of One Year from the 1st of July next.
Tenders to be delivered to the undersigned not later than May 31, 1897.
Further Particulars can be obtained on application.
C. B. NEWTON,
Engineer and General Manager.
Gas-Works, Carlisle,
May 15, 1897.

SHEFFIELD UNITED GASLIGHT COMPANY.

ROOF OVER COAL-STORE.
TO ROOF MANUFACTURERS & CONTRACTORS.

THE Directors of this Company invite TENDERS for the supply and erection of a Corrugated IRON ROOF, with Columns, Girders, and Cast-Iron Guttering, for Coal-Store at their Grimesthorpe Station.
The Roof is 415 feet long by 70 feet span.
Drawings may be seen, and Specification with Bill of Quantities and Form of Tender obtained, on application to the Engineer, Mr. Fletcher W. Stevenson, on payment of 10s. 6d., which will be returned on receipt of a *bonâ-fide* tender.
Sealed tenders, endorsed "Tender for Roof," must be delivered (by post) to the undersigned at the Company's Offices not later than the first post on Saturday, the 5th day of June.
The Directors do not bind themselves to accept the lowest or any tender.
HANBURY THOMAS,
General Manager and Secretary.
Commercial Street, Sheffield,
May 17, 1897.

SHEFFIELD UNITED GASLIGHT COMPANY.

TO GAS EXHAUSTER MANUFACTURERS.

THE Directors of this Company invite TENDERS for the supply and erection at their Grimesthorpe Station of two pairs of TWIN EXHAUSTERS, with Vertical Steam-Engines; each pair to be capable of passing 125,000 Cubic Feet of Gas per hour.
Particulars, with Form of Tender, may be obtained on application to the Engineer, Mr. Fletcher W. Stevenson, on payment of 10s. 6d., which will be returned on receipt of a *bonâ-fide* tender.
Sealed tenders, endorsed "Tender for Exhausters," must be delivered (by post) to the undersigned at the Company's Offices not later than the first post on Saturday, the 5th day of June, 1897.
The Directors do not bind themselves to accept the lowest or any tender.
HANBURY THOMAS,
General Manager and Secretary.
Commercial Street, Sheffield,
May 20, 1897.

SHEFFIELD UNITED GASLIGHT COMPANY.

TO STATION METER MANUFACTURERS.

THE Directors of this Company invite TENDERS for the supply and erection at their Grimesthorpe Station of a 250,000 Cubic Feet per hour STATION METER, in rectangular Cast-Iron Case.
Specification, with Form of Tender, may be obtained on application to the Engineer, Mr. Fletcher W. Stevenson, on payment of 10s. 6d., which will be returned on receipt of a *bonâ-fide* tender.
Sealed tenders, endorsed "Tender for Station Meter," must be delivered to the undersigned (by post) at the Company's Offices not later than the first post on Saturday, the 5th day of June, 1897.
The Directors do not bind themselves to accept the lowest or any tender.
HANBURY THOMAS,
General Manager and Secretary.
Commercial Street, Sheffield,
May 20, 1897.

EXMOUTH GAS COMPANY.

TENDERS FOR GAS COAL.

THE Directors of the Exmouth Gas Company invite TENDERS for 6500 Tons or 3500 Tons (at their option for One or Two Years) of clean, unscreened (through and through) first-class NEWCASTLE, DURHAM, or ALDWARKE MAIN GAS COAL, to be shipped in such quantities (by Sailing Vessels only), and at such times as may be required, commencing from the 1st of August next.
Tenders to be accompanied by Working Analysis; and Prices may be quoted c.i.f. or f.o.b. at Exmouth Docks.
Sealed tenders to be sent to the undersigned, addressed to the Chairman of the Company, and endorsed "Tender for Coal," not later than Saturday morning, the 29th day of May next.
The Directors reserve to themselves the right to accept the whole or any portion of any quantity offered, and do not bind themselves to accept the lowest or any tender (no special Form of Tender issued).
By order,
JAMES T. FOSTER,
Secretary and Manager.
Gas-Works, Exmouth,
May 7, 1897.

THE Directors of the Skibbereen Gas-light and Coke Company, Limited, invite TENDERS for 400 to 500 Tons of the best GAS COAL, delivered in the Ilen River, at the usual place of discharge.

Tenders, with the Analysis of the Coal, will be received by them up to the 1st of June next.

Skibbereen Gas Company,
May 8, 1897.

WARE GASLIGHT AND COAL AND COKE COMPANY, LIMITED.

COAL SUPPLY.

THE Directors of the above Company invite TENDERS for the supply of from 900 to 1200 Tons of EAST PONTOP, NEW PELTON or PELAW MAIN GAS COALS, to be considered at their meeting to be held on Tuesday, the 1st day of June next.

Full Particulars may be obtained on application to me the undersigned at my Office.

By order,
GEO. H. GISBY,
Secretary to the Company.

Town Hall, Ware,
May 18, 1897.

COUNTY BOROUGH OF HALIFAX.

THE Gas-Works Committee of the Halifax Corporation are prepared to receive TENDERS for the supply of 60,000 Tons of GAS COAL and 10,000 Tons of CANNEL COAL, to be supplied in such quantities as may from time to time be determined by the Gas-Works Committee, during the Twelve Months ending the 30th of June, 1898.

Forms of Tender and further Information may be obtained on application to Mr. Thomas Holgate, Engineer, Gas-Works, Halifax.

Tenders, endorsed "Tender for Coal," must be sent to me before Ten a.m., on the 2nd of June, 1897.

The Committee do not bind themselves to accept the lowest or any tender.

By order,
KEIGHLEY WALTON,
Town Clerk.

COUNTY BOROUGH OF HALIFAX.

THE Gas-Works Committee of the Hali-fax Corporation are prepared to receive TENDERS for the SUPPLY of—

1. WROUGHT-IRON TUBES and FITTINGS.
2. CAST-IRON PIPES.
3. LIME for Gas Purification.
4. SULPHURIC ACID.
5. OXIDE OF IRON.

And for the PURCHASE of—

1. SPENT OXIDE OF IRON.
2. BRIMSTONE.
3. CARBON.

For the Twelve Months ending the 30th of June, 1898.

Forms of Tender and further Information may be obtained on application to Mr. Thomas Holgate, Engineer, Gas-Works, Halifax.

Tenders, properly endorsed, to be sent to the undersigned before Ten o'clock a.m., on Wednesday, the 2nd of June, 1897.

By order,
KEIGHLEY WALTON,
Town Clerk.

URBAN DISTRICT COUNCIL OF BUXTON.

TENDERS FOR TAR AND LIQUOR.

THE Buxton District Council invite TENDERS for the purchase of the surplus TAR and LIQUOR produced at their Works in Ashwood Dale, for One, Two, or Three Years, commencing from the 30th of June next.

Further Particulars and Forms of Tender to be obtained of Mr. G. Smedley, Gas Office, Buxton.

Tenders, endorsed "Tender for Tar and Liquor," to be addressed to the Chairman of the Gas Committee, and delivered not later than Twelve Noon on the 29th inst.

The Council do not bind themselves to accept the highest or any tender.

By order,
JOSIAH TAYLOR,
Clerk.

Town Hall, Buxton,
May 13, 1897.

TO COLLIERY PROPRIETORS AND OTHERS.

THE Corporation of Birkenhead are prepared to receive TENDERS for the supply of COAL, COAL NUTS, THRO' and THRO' CANNEL, and CANNEL NUTS for Gas-Making Purposes for a period of One Year, commencing from the 26th of June, 1897.

Forms of Tender, together with any further Information, may be obtained from Mr. T. O. Paterson, C.E., Gas Engineer, Gas-Works, Birkenhead.

Tenders (accompanied by copy of Analysis), stating the price per ton, delivered on to the Gas-Works Railway Siding, must be sent in to me, sealed and endorsed "Tender for Gas-Works Coal," not later than Five o'clock in the afternoon of Friday, the 4th of June, 1897.

Also for a supply of STEAM COAL and SLACK, to be delivered at the Pumping-Stations of the Spring Hill, Playbrick Hill, and Borough Road Water-Works, for a period of One Year, commencing from the 26th of June, 1897.

Forms of Tender, together with any further Information, may be obtained from Mr. W. A. Richardson, C.E., Water Engineer, Town Hall, Birkenhead.

Tenders, stating the price per ton, delivered at the various Pumping-Stations, must be sent in to me, sealed and endorsed "Tender for Water-Works Coal," not later than Five o'clock in the afternoon of Friday, the 4th of June, 1897.

All deliveries to be made from time to time according to the requirements of the respective Engineers.

The Corporation do not bind themselves to accept the lowest or any tender.

By order,
ALFRED GILL,
Town Clerk.

Town Hall, Birkenhead,
May 21, 1897.

SURPLUS TAR AND LIQUOR.

THE Gas Committee of the Bingley Urban District Council hereby invite competent Firms to TENDER for the purchase of their surplus TAR and LIQUOR, as proposed to be manufactured at their Gas-Works, Bingley, during the Twelve Months ending June, 1898.

Forms of Tender to be obtained from the undersigned, which, when duly filled up, must be addressed to James Gatecliff, Esq., Chairman of the Committee, Town Hall, Bingley, on or before the 14th day of June, 1897.

By order,
GEORGE DUNBAR MALAM,
Engineer.

Gas-Works, Bingley,
May 11, 1897.

SOUTH SHIELDS GAS COMPANY.

TO METER MANUFACTURERS.

THE Directors of the South Shields Gas Company invite TENDERS for the supply of DRY GAS-METERS required during the Year ending June, 1898.

The Meters must be of best quality, and delivered at the Gas-Works, carriage paid.

The Directors do not bind themselves to accept the lowest or any tender.

Form of Contract and further Particulars may be had on application.

Sealed tenders, marked "Tender for Meters," to be delivered to the undersigned not later than Friday morning, the 4th of June next.

J. H. PENNEY,
Secretary.

Gas Offices: Chapter Row,
South Shields, May 22, 1897.

GLOUCESTER GASLIGHT COMPANY.

TENDERS FOR GAS COAL.

THE Directors of the above Company invite TENDERS for the supply of about 24,000 Tons of GAS COAL for One Year from the 1st day of July next, in such monthly quantities as may be required by the Company.

Tenders to state the price delivered at the Midland Railway Wharf, High Orchard, or the Great Western Railway Wharf, Llanthony, Gloucester; or if sent (as preferred) by Water, the price f.o.b., and also the price delivered at the Gas Company's Wharf on the Gloucester and Berkeley Canal.

Further Particulars and Forms of Tender may be obtained of the Company's Engineer, Mr. R. Morland.

Sealed tenders, endorsed "Tender for Coal," specifying the description and quality of the Coal, to be addressed to the Chairman, Gas Offices, Eastgate Street, Gloucester, and delivered not later than the 29th day of May inst.

The Directors reserve to themselves the right to accept the whole or any portion of any quantity offered, and do not bind themselves to accept the lowest or any tender.

By order,
WILLIAM E. VINSON,
Secretary.

Gas Offices, Gloucester,
May 6, 1897.

BOROUGH OF MACCLESFIELD.

THE Gas Committee are prepared to receive TENDERS for the supply of the undermentioned:—

1. The whole or part of 10,000 Tons of best screened GAS COAL, 2000 Tons of CANNEL, and also a supply of the best Hand-Picked BUXTON LIME, free from Dirt and Ashes, in such quantities as may be required, to be delivered free at Macclesfield, and to weigh 20 cwt. to the ton over the Committee's Weighing-Machine at their Works.
2. Wrought-Iron Lap-Welded STEAM TUBES and FITTINGS.
3. Cast-Iron MAINS and IRREGULARS.
4. METERS.
5. LEAD PIPE.
6. BRASS TAPS and FITTINGS.

Forms of Tender and Conditions may be had on application to the Engineer, Gas-Works, Macclesfield.

Tenders, sealed and endorsed, to be sent in not later than Saturday, the 12th day of June, 1897, addressed to the Chairman, Gas Committee, Town Hall, Macclesfield.

The Committee do not pledge themselves to accept the lowest or any tender.

W. FREDK. TAYLOR,
Town Clerk.

May 10, 1897.

TENDERS FOR GAS COAL.

THE Gas Committee of the Town Commissioners of Newry invite TENDERS for the supply of from 3000 to 3600 Tons of GAS COAL, to be delivered in such quantities and at such times as may be required by the Committee, and delivered free *ex* Ship or Steamer at Albert Basin, Newry.

The Coal to be fresh wrought, dry, and free from Clench, Pyrites, or other objectionable matter for Gas Making.

The Committee would assist the Contractor by allowing him to deliver about 1000 Tons of Coal prior to the 1st of November next.

Further Particulars may be obtained from Mr. A. Gibb, Manager.

Sealed tenders, endorsed "Tender for Coal," specifying the description and quality of the Coal, and where raised, to be addressed to the Chairman, and delivered to the undersigned not later than Ten a.m., on Friday, the 4th of June next.

The Committee reserve to themselves the right to accept the whole or any portion of any quantity offered, and do not bind themselves to accept the lowest or any tender.

By order,
R. H. DOHERTY,
Town Clerk.

New Town Hall, Newry,
May 21, 1897.

CROMER, NORFOLK.

TENDERS FOR COAL.

THE Directors of the Cromer Gas and Coke Company, Limited, are prepared to receive TENDERS from Colliery Proprietors only, for the supply of 1500 Tons of first-class GAS COAL, to be delivered at (*a*) the Great Eastern Railway Station, or (*b*) the Midland and Great Northern Railway Station, Cromer, between the 1st day of June next, and the 31st day of May, 1898. Weight given to be stated.

Deliveries to be made in such quantities and at such times as may be required by the Company.

Payment, net cash monthly.

Sealed tenders, endorsed "Tender for Coal," to be sent to the undersigned, on or before the 31st of May inst. Forms of Tender are not supplied.

The Directors do not bind themselves to accept the lowest or any tender.

By order,
P. E. HANSELL,
Secretary.

Cromer, May 20, 1897.

THE CRANBROOK DISTRICT WATER ACT 1895.

ISSUE OF 15,000 SHARES OF £1 EACH.

Under Provision of Section 8 of the Cranbrook District Water Act, 1895, ranking for Dividend up to 10 per cent.

MINIMUM PRICE OF ISSUE IS PAR.

INTERIM DIVIDENDS AT THE RATE OF THREE-AND-A-HALF PER CENT. PER ANNUM WILL BE PAYABLE HALF YEARLY,

the 1st of March and the 1st of September;

The first being a full Six Months, and payable on the 1st day of September, 1897.

TENDERS ARE INVITED BY THE CRANBROOK DISTRICT WATER COMPANY FOR 15,000 ORDINARY SHARES of £1 each (ranking for Dividend up to 10 per cent.), as follows:

On APPLICATION, 10 per cent.
On WEDNESDAY, the 2nd day of June, 1897, 50 per cent. on the amount tendered and accepted.
On WEDNESDAY, the 23rd day of June, 1897, Balance of amount payable.

THE Act of 1895 was obtained for incorporating the Cranbrook District Water Company, and empowering them to construct Works and supply Water, and for other purposes, and states:

Whereas the several parishes and places in the county of Kent in this Act mentioned are at present inadequately supplied with Water, and it is expedient that provision should be made for affording an adequate supply of pure and wholesome Water thereto,

And whereas the persons in that behalf in this Act named with others are willing, on being incorporated into a Company with the necessary powers for such purposes, to undertake the supply of Water to such Parishes and Places, and it is expedient that they should be incorporated accordingly, and authorized to construct Water-Works as by this Act provided, and that such other powers as are in this Act contained should be conferred on them for the better and more effectually carrying the purposes of this Act into effect, &c., &c.

The limits of this Act for the supply of Water hereinafter referred to as "the limits of this Act or the District" shall be the parishes of Cranbrook, Goudhurst, and Hawkhurst, in the county of Kent.

The Mains are now being laid, and the Reservoir will shortly be commenced, and the Pumping-Station is nearing completion for supplying the Towns and Parishes of Cranbrook, Goudhurst, and Hawkhurst, which at present have no Water Supply. The Population at last census was over 10,000; and the Rateable Value of the Parishes, which is yearly increasing, £46,430. The supply of Water obtained is 200,000 gallons a day, which is considerably in excess of what will be required in the District for many years.

The Water has been analyzed by Mr. Otto Hehner, Public Analyst for Nottinghamshire, West Sussex, &c., who reported on the 12th inst. as follows: "The supply is, in my opinion, in every way excellent in quality, and well suited for domestic purposes (drinking, washing, and cooking), and also for boiler and manufacturing purposes."

Pending completion of the Works, 3½ per cent. Dividend is guaranteed for two years; and this sum has been deposited in Consols.

Owing to the great demand for Water in the Districts, which will all be supplied from one Reservoir, and the future developments likely to take place, owing to the opening of the new Railway, having Stations at each of the towns this Company will supply, the Directors are confident that the Maximum Dividend of 10 per cent. will be paid.

In making these calculations, no account has been taken of the revenue which will be derived from special consumers, such as the South-Eastern Railway Company, Breweries, &c., or the use of Water for agricultural purposes.

The value of similar Water-Works Investments is illustrated by the present value of ordinary stock in the Kent Water-Works Company, which is quoted at £345, or equal to 245 per cent. premium.

Tenders on the form accompanying the Prospectus, with the required deposit, may be delivered at the Company's Bankers, the London and County Banking Company, before Two o'clock on Thursday, the 27th day of May, 1897, marked "Tender for Cranbrook Water Shares." Tenders at a price including fractions of a shilling other than sixpence will not be preferentially accepted. When no allotment is made, the deposit will be returned in full; and in case of a partial allotment, the balance of the deposit will be applied towards the next instalment. If default be made in payment of any instalment at its proper date, the deposit and instalments previously paid will be liable to forfeiture.

The Registers of Shares will be kept at the Company's Office, Cranbrook, Kent.

Prospectuses and Forms of Application may be obtained at the LONDON AND COUNTY BANKING COMPANY, LIMITED, 21, Lombard Street, LONDON, E.C., CRANBROOK, or other Branches.

Water-Works Offices, Cranbrook, May 1, 1897.

HAWORTH URBAN DISTRICT COUNCIL.

TENDERS are invited by the above Council for the supply of 2000 Tons of unscreened GAS COAL, to be delivered (in such quantities as the Council may determine) on Rails at Haworth Railway Station within the ensuing Twelve Months.

Sealed tenders to be forwarded to me the undersigned, marked "Coal Tender," not later than the 27th inst.

WM. ROBERTSHAW,
Clerk.

Burlington Chambers, Keighley,
May 6, 1897.

THE Widnes Corporation invite Tenders for the supply of about 20,000 Tons of GAS COAL (Slack, "Through and Through," or Screened Coal), for the period ending June 30, 1898, to be delivered at the Gas-Works, Widnes.

Conditions and Forms of Tender may be obtained from Mr. I. Carr, Assoc.M.Inst.C.E., Gas Engineer, Widnes.

Tenders, endorsed "Gas Coal," to be delivered to the undersigned on or before the 31st of May inst.

The lowest or any tender not necessarily accepted.

H. S. OPPENHEIM,
Town Clerk.

Town Hall, Widnes,
May 15, 1897.

BOROUGH OF DONCASTER.

TENDERS FOR COAL.

THE Gas Committee of the Borough of Doncaster are prepared to receive TENDERS for the supply of 18,000 Tons of best GAS COAL, during a period commencing July, 1897, and terminating June 30, 1898, or as may be afterwards arranged.

Particulars and Tender Forms may be obtained on application to the undersigned.

Tenders should be sent, under seal, to John Athron, Esq., the Chairman, endorsed "Tender for Coal," not later than Ten a.m., on Wednesday, the 9th of June next.

By order of the Gas Committee, who do not bind themselves to accept the lowest or any tender.

RT. BRIDGE,
Engineer.

Gas-Works, Doncaster,
May 18, 1897.

SHREWSBURY GASLIGHT COMPANY.

TENDERS FOR COAL.

THE Directors of the Shrewsbury Gas-light Company invite TENDERS for the supply of about 12,000 Tons of screened GAS COAL, to be delivered free at the Great Western or London and North-Western Goods Yard, Shrewsbury, during the Year commencing July 1, 1897, and ending June 30, 1898.

The Directors reserve to themselves the right to divide the quantity into two or more Contracts, and do not bind themselves to accept the lowest or any tender.

Tenders must be made on Forms (containing further Particulars), which may be obtained on application at the Company's Works, or by post, and must be sent to the undersigned, on or before the 17th day of June, 1897.

By order,
WM. BELTON, Assoc.M.Inst.C.E.,
Secretary and Manager.

Gas-Works, Shrewsbury,
May 21, 1897.

SCARBOROUGH GAS COMPANY.

TAR AND AMMONIACAL LIQUOR.

THE Directors of the Scarborough Gas Company invite TENDERS for the surplus TAR and the whole of the AMMONIACAL LIQUOR to be produced at their Works for One or more Years from the 1st day of July next.

Tenders for Liquor may be submitted either at a fixed price per ton or on a Sliding-Scale, regulated by the price of Sulphate. Preference will, however, be given to the latter.

Further Particulars may be obtained on application to the undersigned, to whom sealed tenders (duly endorsed) must be delivered not later than noon, on Saturday, the 12th of June next.

The Directors do not bind themselves to accept the highest or any tender.

By order of the Board,
(Signed) J. HOLLIDAY,
Engineer and Secretary.

Gas Offices: 32, Westborough,
Scarborough, May 19, 1897.

SUTTON-IN-ASHFIELD URBAN DISTRICT COUNCIL.

(GAS DEPARTMENT.)

TENDERS FOR GAS COAL AND CANNEL.
TENDERS FOR TAR & AMMONIACAL LIQUOR.

COAL.

THE Gas Committee of the above Dis-trict Council are prepared to receive TENDERS for the supply of 500 Tons of CANNEL and 3000 Tons of well-screened GAS COAL, to be free from Shale and Pyrites, and to be delivered at the Town Station, Sutton-in-Ashfield, in such quantities as the Manager shall from time to time direct, between July 1, 1897, and June 30, 1898.

TAR AND LIQUOR.

TENDERS for the surplus TAR and AMMONIACAL LIQUOR produced at their Works from July 1, 1897, to June 30, 1898.

Tenders for Coal to state price per ton of 20 cwt. at the Works, or at Sutton Town Station.

No Tender Forms provided.

The Committee do not bind themselves to accept the lowest or any tender.

Tenders, endorsed, to be addressed as under so as to arrive not later than the 1st day of June, 1897.

By order,
JOHN D. FIDLER,
Clerk.

District Council Offices,
Sutton-in-Ashfield, Notts,
May 21, 1897.

THE Directors of the Skipton Gas Com-pany are prepared to receive TENDERS for the purchase and removal of the surplus TAR and AMMONIACAL LIQUOR produced at their Works during Twelve Months ending June 30, 1898.

Particulars may be obtained from the undersigned, to whom sealed and endorsed tenders may be sent not later than June 8 next.

The Directors do not bind themselves to accept the highest or any tender.

J. HAIGH,
Secretary.

Skipton, May 13, 1897.

COAL CONTRACT.

THE Directors of the Hexham Gas Com-pany are prepared to receive TENDERS for the supply of about 2800 Tons of unscreened GAS COAL, delivered at Hexham Station as directed, during the Year ending June 30, 1898.

Tenders, with Analysis of Coal and Name of Pit at which it is raised, to be forwarded to the undersigned not later than the 1st of June.

HERBERT LEES,
Secretary and Manager.

Gas-Works, Hexham,
May 13, 1897.

MOSSLEY CORPORATION GAS-WORKS.

THE Gas Committee are prepared to give TENDERS for the surplus TAR produced at their Works between the 25th of March last and the 25th of March, 1898.

Particulars and Form of Tender may be had on application to the Manager (R. Merrell), at the Works.

Sealed and endorsed tenders must be delivered to the undersigned not later than the 5th of June next.

The Committee do not bind themselves to accept the highest or any tender.

JOSEPH HYDE,
Town Clerk.

TENDERS FOR GAS COAL, TAR, &c.

THE Directors of the Oakengates and St. George's Gas Company invite TENDERS for the supply of 1600 Tons of the best screened GAS COAL, delivered free at the G.W. Railway Station, Oakengates, in such quantities as may be required from June 30, 1897, to June 30, 1898.

Tenders, endorsed, and accompanied by an Analysis of the Coal offered, to be sent to the Manager on or before June 17, 1897.

TENDERS also invited for the supply of LIME and the purchase of TAR and AMMONIACAL LIQUOR for One Year.

The Directors do not bind themselves to accept any tender.

EDWARD PARKER,
Manager.

May 21, 1897.

TO COLLIERY PROPRIETORS AND OTHERS.

THE Leek Urban District Council invite TENDERS for the supply of best screened GAS COAL and NUTS for One Year from the 1st of July next, to be delivered at the Leek Station, on the North Staffordshire Railway, at such times and in such quantities as may be required.

Further Particulars and Forms of Tender may be obtained from the undersigned.

Sealed and endorsed tenders, addressed to the Chairman of the Gas Committee, to be delivered at the Town Hall, Leek, by Four o'clock in the afternoon of Monday, the 31st of May inst.

The lowest or any tender will not necessarily be accepted.

By order,
C. HENSHAW,
Clerk.

Town Hall, Leek,
May 11, 1897.

BOROUGH OF SAFFRON WALDEN.

TENDERS FOR COAL.

THE Gas and Water Undertaking Com-mittees of the Town Council are prepared to receive TENDERS for the supply of about 1100 Tons of best screened GAS COAL, and about 130 Tons of best hand-picked hard STEAM COAL respectively, for the Twelve Months ending June 30, 1898.

Full Particulars can be obtained on application to Mr. G. William Lacey, Borough Surveyor.

Sealed tenders, endorsed "Tender for Gas Coal," or "Tender for Steam Coal," as the case may be, to be addressed and sent to me, the undersigned, not later than Five o'clock in the afternoon, on Monday, the 7th of June next.

The lowest or any tender will not necessarily be accepted.

W. ADAMS,
Town Clerk.

Saffron Walden,
May 22, 1897.

BELPER GAS AND COKE COMPANY.

TENDERS FOR COAL AND CANNEL.

THE Directors are prepared to receive TENDERS for the supply at their Works, situate near the Railway Station, Belper, of 3000 Tons more or less of GAS COAL (part in the Gas Company's own Waggons); also, about 400 Tons more or less of CANNEL COAL, to be delivered at such times, and in such quantities, as the Directors or their authorized servants shall from time to time order.

Sealed tenders, stating price per ton of 21 cwt., and Information as to the quality and quantity of Gas the Coal is estimated to produce, also, as to where the same is now in use, to be sent to the undersigned, on or before Friday, the 4th of June.

The Directors do not bind themselves to accept the lowest or any tender, nor to take the whole of the above quantities of Coal or Cannel.

By order,
JOSEPH PYM,
Managing-Director.

Belper, May 13, 1897.

BOROUGH OF HEYWOOD.

THE Gas Committee invite Tenders for surplus TAR. Estimated quantity, 650 Tons.

Further Particulars and Form of Tender may be obtained from Mr. W. Whatmough, Gas Manager.

Tenders, endorsed "Tar," to be sent to me not later than Tuesday, June 15, 1897.

By order,
J. H. BALDWICK,
Town Clerk.

Municipal Buildings, Heywood,
May 29, 1897.

THE Directors of the Kildwick Parish Gas Company invite TENDERS for the supply of the whole or part of 3000 Tons of best screened GAS COAL or NUTS, to be delivered free at Kildwick during the Twelve Months ending June 30, 1898.

The Coal to be delivered at such times and in such quantities as the Manager may direct.

Tenders to be sent in not later than May 31, 1897.

FRED. H. PICKLES,
Manager and Secretary.

Gas-Works, Kildwick,
May 17, 1897.

THE Accrington District Gas and Water Board invite TENDERS for the surplus TAR and AMMONIACAL LIQUOR which may be produced at their Accrington and Great Harwood Works during the Year from the 20th of June to the 30th of June, 1898.

Coal Carbonized at Accrington, 16,400 Tons.
Do. Great Harwood, 11,200 ,,

Tenders, endorsed, to be sent to A. H. Aitken, Esq., Clerk to the Board, on or before Thursday, the 3rd of June.

Particulars can be obtained from the undersigned.

CHAS. HARRISON,
General Manager.

COUNTY BOROUGH OF OLDHAM.

THE Gas-Works Committee invite TENDERS for the purchase of about 7200 Tons of TAR and 2,500,000 Gallons of AMMONIACAL LIQUOR, to be produced at their different Works during One Year, commencing the 1st of July next.

Specification and Form of Tender may be obtained from Mr. Arthur Andrew, Gas and Water Offices, Oldham, to whom tenders are to be sent on or before Tuesday, June 8, 1897.

A. NICHOLSON,
Town Clerk.

Oldham, May 18, 1897.

MARKET HARBOROUGH GAS COMPANY, LIMITED.

THE Directors of the above Company are prepared to receive TENDERS for the supply of about 3000 Tons of fresh wrought and screened GAS COAL; also for 100 Tons of LIME, and 40 Tons of SULPHURIC ACID.

Sealed and endorsed tenders to be sent to the Chairman by June 10.

Coal Tender Forms and further Particulars on application to the undersigned.

J. FRYER,
Manager.

Gas Office, St. Mary's Road,
Market Harborough, May 17, 1897.

TENDERS FOR TAR AND LIQUOR.

THE Aberdare Gas Company invite TENDERS for the purchase of their surplus TAR, and the AMMONIACAL LIQUOR produced from about 5000 Tons of Coal per annum. The strength of the Liquor to be tested by Twaddel's Hydrometer (Temperature 60°); and the tender to name the price per ton of 4° rising by ½° up to 7°, delivered in Purchaser's Railway Tanks at the Gas-Works.

Tenders may be sent in for either Tar or Liquor on or before the 6th of June next (the lowest or any tender not necessarily accepted), to

EVAN JONES,
Secretary and General Manager.

Gas-Works, Aberdare,
May 12, 1897.

NORTHWICH GAS COMPANY.

THE Directors of the Northwich Gas Company invite TENDERS for the supply of COAL to their Works during a period of Twelve Months ending May 31, 1898.

TENDERS are also invited for the supply of LIME during the same period.

Form of Tender and any other Particulars required may be had on application to Mr. S. S. Mellor, the Manager.

Tenders, endorsed "Coal" or "Lime," and addressed to the Chairman, must be delivered here not later than Friday, June 4, 1897.

HY. PICKERING,
Secretary.

Gas-Works, Northwich,
May 22, 1897.

COUNTY BOROUGH OF WEST BROMWICH.

(GAS DEPARTMENT.)

TO COLLIERY PROPRIETORS.

THE Gas Committee are prepared to receive TENDERS for the supply of 22,000 Tons of GAS COAL, for use at their Works, Albion, West Bromwich. Also for 500 Tons of high class CANNEL COAL.

The Committee do not bind themselves to accept the lowest or any tender; and they reserve to themselves the right to divide the contract between several Firms.

Forms of Tender may be obtained upon application to Mr. Thomas Glover, Manager of the Works.

Sealed tenders, properly endorsed, to be sent to me not later than the 5th of June.

By order,
THOS. HUDSON,
Secretary.

Town Hall, West Bromwich,
May 22, 1897.

THE Directors of the Longford Gas Company, Limited, Ireland, invite TENDERS for the supply of 500 or 600 Tons of best GAS COAL, delivered free into Midland Great Western Railway Waggons at Spencer Dock, Dublin.

Tenders will be considered on Monday, the 7th of June, and should be addressed to the Chairman, Thos. C. Maxwell, Esq., endorsed "Tender for Coal."

The lowest or any tender not binding on the Directors.

By order,
W. A. REID,
Secretary.

CHELSEA WATER-WORKS COMPANY.

NOTICE is Hereby Given, that the HALF-YEARLY GENERAL MEETING of the Governor and Company of Chelsea Water-Works will be held at their Office, Commercial Road, Pimlico, in the County of London, on Thursday, the 17th day of June prox., at One o'clock in the afternoon precisely, for the General Business of the Company.

At this Meeting, the Directors and an Auditor, whose Names are stated below, will, under the provisions of the Company's Special Act of Parliament, go out of office, by rotation, and offer themselves for re-election.

The Directors going out of office by rotation are William Hamilton Yatman, Esq., William Peter Bodkin, Esq., and Jackson Hunt, Esq.

The Auditor going out of office by rotation is Herbert H. Child, Esq.

The REGISTER OF TRANSFERS WILL BE CLOSED between the 5th day of June prox., and the 17th day of June prox., both days inclusive.

By order,
G. H. GILL,
Secretary.

Office: 41, Commercial Road,
Pimlico, May 22, 1897.

CLACTON-ON-SEA GAS AND WATER COMPANY.

2000 £5 NEW ORDINARY SHARES, ranking for a Standard Dividend of 7 per cent.

CHERTSEY GAS COMPANY.

400 £10 NEW 7½ PER CENT. SHARES, and 50 £10 NEW 7 PER CENT. SHARES.

MESSRS. EDWIN FOX AND BOUSFIELD will include in their next STOCK and SHARE AUCTION, at the Mart, on Tuesday, June 1, at Two o'clock, in Lots, the above SHARES.

Particulars at the AUCTIONEERS' OFFICE, 99, Gresham Street, BANK, E.C.

ISSUE OF STOCKS AND SHARES BY AUCTION UNDER PARLIAMENTARY POWERS.

MR. ALFRED RICHARDS undertakes the issuing by Auction of GAS AND WATER SHARES under Parliamentary Powers.

He also holds MONTHLY SALES of GAS AND WATER SHARES at the Auction Mart, Tokenhouse Yard, E.C.

Terms for the issuing of Capital, and also for offering to auction Gas and Water Shares, and all Particulars relating thereto, may be had of Mr. Alfred Richards.

Offices: 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
HARROW AND STANMORE GAS COMPANY.

SALE OF 500 SHARES.

MR. ALFRED RICHARDS will Sell BY AUCTION, at the Mart, London, E.C., on Wednesday, May 26, at Two o'clock, in Lots, 500 £10 "C" SHARES (fully-paid) in the HARROW AND STANMORE GAS COMPANY, ranking for a Standard Dividend of 7 per cent.; the last Dividend on the same class of Shares having been at the rate of 5½ per cent. per annum, and offering an Investment of the soundest character.

Particulars of the SECRETARY of the COMPANY, at the Gas-Works, HARROW, and of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By Order of the Directors.

500 SHARES IN THE
SOUTHEND WATER-WORKS COMPANY.

MR. ALFRED RICHARDS will Sell by AUCTION, at the Mart, E.C., on Wednesday, May 26, at Two o'clock, in lots, 500 £10 SHARES (to be issued as fully paid) in the above Undertaking, ranking for a Maximum Dividend of 7 per cent.; the last Dividend on the same class of Shares having been at the rate of 5 per cent. per annum.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of Executors and others.

GAS AND WATER DEBENTURE AND ORDINARY STOCKS AND SHARES IN THE

Brentford Gas Company.
Tonbridge Gas Company.
Wandsworth and Putney Gas Company.
Barnet District Gas and Water Company.
Hornsey Gas Company.

MR. ALFRED RICHARDS will Sell the above BY AUCTION, at the Mart, London, E.C., on Wednesday, the 26th of May, at Two o'clock, in lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

PRICE'S COKE & COAL BARROW

effects a great saving of time, labour, and expense.

For Particulars, Price, &c., apply to Mr. EDWARD PRICE, 119, Queen's Road, FINSBURY PARK, N.

Prices are Reduced.

CITY OF RIPON.

THE Gas Committee are prepared to receive TENDERS for the supply and delivery of about 3000 Tons of GAS COAL for a period of Twelve Months, commencing the 1st of July next.

For further Particulars, apply to Mr. F. Shepherd, Gas Manager, Ripon.

Sealed tenders, endorsed "Tender for Gas Coal," to be sent to me on or before the 2nd of June next.

The Corporation do not bind themselves to accept the lowest or any tender.

By order,
M. KIRKLEY,
Town Clerk.

Ripon, May 8, 1897.

TENDERS FOR GAS COAL.

THE Directors of the Ramsey Gas Company (Huntingdonshire) invite TENDERS for the supply of 400 Tons of best Screened GAS COAL, to be delivered during the ensuing Twelve Months, in quantities monthly as may be required.

Tenders, stating price per ton, delivered free at Ramsey (G.N. or G.E.) Stations, to be sent to the undersigned on or before the 2nd of June.

The Directors do not bind themselves to accept the lowest or any tender.

WILLIAM ORRISS,
Secretary.

Ramsey, May 20, 1897.

Price 6s., Cloth Bound,

THE CHEMISTRY OF ILLUMINATING GAS.

By N. H. HUMPHRYS, Assoc M.Inst.C.E., F.C.S.

LONDON:
WALTER KING, 11, Bolt Court, Fleet Street, E.C.

AUTOMATIC GAS-METERS.

A Berlin Firm in the Gas Line desire for Berlin, (eventually for Germany), THE EXCLUSIVE SALE OF AUTOMATIC GAS-METERS; and for this purpose wish to enter into relations with a leading English Firm, manufacturing as a speciality a first-class article.

ADDRESS:
I. Qu. 6934, care of
RUDOLF MOSSE, BERLIN, S.W.

HOLMSIDE GAS COALS.

PRESENT DAILY PRODUCE OVER 4000 TONS.

LATEST ANALYSIS—By CHARLES PHILLIPS, Gas Examiner to Rotherham Corporation.

Yield of Gas Per Ton . . 11,205 Cubic Feet.
Illuminating Power, 16 7/10 Stand. Sperm. Candl.
Coke (of good & pure quality) 13¾ Cwt. Per Ton.
Sulphur . . . . A little over 1 Per Cent.
Ash . . . . . Under 1 Per Cent.
Tar . . . . . 163 Lbs. (Avoir.) Per Ton.
Ammoniacal Liquor 103 Lbs. (Avoir.) Per Ton.

HOLMSIDE GAS COALS are supplied to the largest Gas Companies in England and on the European Continent; London alone consuming about half the produce.

SOUTH MOOR PELTON GAS COALS.

PRESENT DAILY PRODUCE AVAILABLE 2500 TONS.

RESULTS OF DIFFERENT ANALYSES:—

Yield of Gas Per Ton . . 10,500 Cubic Feet.
Illuminating Power . 17 Stand. Sperm Candl.
Coke (of excellent quality) . 13½ Cwt. Per Ton.
Sulphur . . . . . 1·13 Per Cent.
Ash . . . . . 1·34 Per Cent.
Tar . . . . . 180 Lbs. (Avoir.) Per Ton.
Ammoniacal Liquor 94½ Lbs. (Avoir.) Per Ton.

The HOLMSIDE and SOUTH MOOR COALFIELD possesses *a very great quantity of the best Coal;* and, whilst other Coal-Fields are becoming exhausted, this one is only being opened out, so that *the quality* of both the HOLMSIDE COALS, and the SOUTH MOOR COALS *may be relied upon for all practical purposes.*

These Coals may be bought through the Principal Merchants in England, or direct from

MR. MARK ARCHER,
HOLMSIDE AND SOUTH MOOR OFFICES,
NEWCASTLE-UPON-TYNE.

HEBBURN MAIN GAS COALS.

Yield of Gas per ton . . . . . 10,500 cub. ft.
Illuminating Power . . . . . 16·4 candles.
Coke . . . . . 68 per cent.

For Prices, f.o.b. Ship or Delivered by Rail, apply to

THE WALLSEND & HEBBURN COAL COMPANY, LTD.
8 Lombard Street,
NEWCASTLE-ON-TYNE.
W. RICHARDSON, Fitter.

JAMES OAKES & Co.,
ALFRETON IRON-WORKS, DERBYSHIRE,
AND
Wenlock Iron Wharf, 21 & 22, Wharf Road,
CITY ROAD, LONDON, N.,

Manufacture and keep in Stock at their Works (also large stock in London)

PIPES and CONNECTIONS, 1½ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with bolts, nuts and covers, and rendering leakage impossible.

LONDONDERRY GAS COALS

FROM THE

MARQUIS OF LONDONDERRY'S COLLIERIES,

COUNTY OF DURHAM.

Available output up to 5000 tons per day.
Yield of Gas 11,000 cubic feet per ton of Coal as per analysis by
Mr. John Pattinson, F.C.S., F.I.S.

FOR PRICES AND PARTICULARS, APPLY TO

S. J. DITCHFIELD,
SEAHAM HARBOUR, COUNTY OF DURHAM.

THE SILICA FIRE-BRICK COMPANY,

OUGHTIBRIDGE, near SHEFFIELD,

MANUFACTURE

SILICA BLOCKS, BRICKS, AND CEMENT

OF SUPERIOR QUALITY

FOR GAS-FURNACES.

Trade Mark: "SILICA."

These Goods (largely used in Gas, Glass, Iron, and Steel Works) are, on account of their

GREATER DURABILITY,

Strongly recommended where EXCESSIVE HEATS have to be maintained.

THOMAS TURTON AND SONS, LIMITED,
SHEAF WORKS, SHEFFIELD,
MANUFACTURERS OF
FILES OF BEST QUALITY
FOR ENGINEERS.
STEEL OF ALL DESCRIPTIONS.

SCREW STOCKS, TAPS AND DIES,
SPANNERS, RATCHET BRACES, LIFTING JACKS,
ANVILS, VICES,
AND ENGINEERS' TOOLS GENERALLY.

LONDON OFFICE:
90, CANNON STREET, E.C.

TROTTER, HAINES, & CORBETT,

Brettell's Estate

FIRE-CLAY & BRICK WORKS,

STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.

Proprietors of

BEST GLASSHOUSE POT & CRUCIBLE CLAY.

SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

LONDON OFFICE: R. CULL, 84, OLD BROAD ST., E.C.

THORNLEY GAS COALS

WORKED BY THE

WEARDALE IRON & COAL Co., Ld.

OUT OF THEIR

THORNLEY AND WHEATLEY HILL COLLIERIES.

Analysis made by

Messrs. J. & H. S. PATTINSON, *May 28, 1895.*

Yield of Gas per Ton . .	10,500 Cub. Ft.
Illuminating Power . .	16·9 Candles.
Coke (of good quality) . .	67·5 per Cent.
Sulphur	0·58 „
Ash	2·73 „

For Price, &c., apply to the

WEARDALE IRON & COAL Co., Ld.

QUAYSIDE, NEWCASTLE-ON-TYNE.

BOLDON GAS COALS.

Worked by THE HARTON COAL CO., LTD.

Output about 3000 tons per day.

ANALYSIS—

Yield of Gas per ton . .	10,500	Cubic Feet.
Illuminating Power . .	16·9	Candles.
Coke	66·7	Coke.
Sulphur	0·86	Sulphur.
Ash	2·04	Ash.

Boldon Gas Coals are supplied under contract to

The Gaslight and Coke Company, South Metropolitan Gas Company, Commercial Gas Company, Imperial Continental Gas Association, European Gas Company, L'Union des Gaz (the Continental Union Gas Company), Crystal Palace District Gas Company, Danish Gas Company, Bombay Gas Company, San Paulo Gas Company, Alliance and Dublin Consumers' Gas Company, Ipswich Gaslight Company, Newcastle Gas Company, Sunderland Gas Company, South Shields Gas Company, and to many other Companies at Home and Abroad.

For Prices, &c., apply to the

HARTON COAL COMPANY,

LIMITED,

Newcastle-on-Tyne.

W. H. PARKINSON,
FITTER.

WATERBLEAN PAINT

TELEGRAMS:
"EVESON, BIRMINGHAM."

UNEQUALLED.

Gas Companies are solicited to try Samples of the

MIRFIELD

BLACK BED GAS COAL.

Prices and Analysis on application.

MIRFIELD (GAS-COAL) COLLIERY COMPY.
RAVENSTHORPE, NEAR DEWSBURY.

GAS ILLUMINATION JUBILEE DEVICES.

ORDER EARLY

ORDER EARLY

PRICE LISTS ON APPLICATION

JAMES MILNE & SON

— LIMITED —

EDINBURGH, LONDON, LEEDS AND GLASGOW.

NEWBATTLE CANNEL.

Highest Results in Gas, & Excellent Coke.

QUOTATIONS ON APPLICATION TO

THE LOTHIAN COAL COMPANY,

LIMITED,
NEWBATTLE COLLIERIES,

DALKEITH, N.B.

EXTRACTION APPARATUS

SPECIALLY DESIGNED

TO EXTRACT THE SULPHUR FROM SPENT OXIDE.

BUILT BY

WEGELIN & HÜBNER, HALLE a/S.

ENGINEERS AND IRONFOUNDERS.

Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887, for

CANNEL & COAL.

TYNE

BOGHEAD CANNEL.

Yield of Gas per ton	13,155 cub. ft.
Illuminating Power	38·22 candles.
Coke per ton	1,301·88 lbs.

EAST PONTOP GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	17·8 candles.
Coke	70 per cent.

SOUTH PELAW MAIN GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	73·1 per cent.

For Prices and complete Analysis, apply to

THOS. W. DANCE & SONS,

COAL OWNERS, NEWCASTLE-ON-TYNE;

OR

E. FOSTER & CO.,

21, JOHN STREET, ADELPHI, LONDON, W.C.

HEATHCOTE GAS COAL.

RICH IN ILLUMINATING POWER AND YIELD OF GAS.

ABOVE THE AVERAGE IN WEIGHT AND QUALITY OF COKE.

MAINTAINS A HIGH STANDARD IN RESIDUALS.

THE GRASSMOOR Co., Ld., CHESTERFIELD.

THE "COOMBE" DRAUGHT SCREEN
FOR INCANDESCENT BURNERS.
For Illustration and Statement of Advantages to be gained by its use, see "JOURNAL," May 4, p. 1020.
ALFRED ARCULUS & CO., Glass Manufacturers,
BIRMINGHAM.

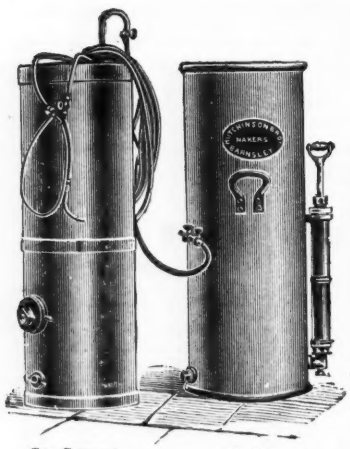
ROBERT MARSHALL,
CANNEL COAL MERCHANT,
97, WELLINGTON STREET, GLASGOW.
Prices and Analysis of all the Scotch Cannels on Application.

E. ASQUITH & CO.,
Hydraulic Engineers,
17, Mather Street, Ancoats, Manchester,
Fit up Plants for
Pressing Anthracene, Naphthalene, &c.
Competent Men sent out to erect same. Estimates given.

G. & J. HAIGH,
Raven's Lodge Fire-Brick Works, DEWSBURY.
FIRE-BRICKS of the highest Quality, made from Fire-Clay of a most Superior and Refractory Character, suitable for GLASS-WORKS, GAS-WORKS, and BLAST-FURNACES.
WHITE GLAZED AND SALT GLAZED BRICKS, BUFF FACING BRICKS, &c.
For Prices and Analysis, apply as above.

COLUMNLESS GASHOLDERS
GUIDED BY STEEL CABLES (PEASE'S SYSTEM).
GREAT SAVING IN COST, AND
ABSOLUTELY RELIABLE IN WORKING.
Write for Testimonials and Photographs.
ASHMORE, BENSON, PEASE, & CO., LTD., STOCKTON-ON-TEES.
PATENTEES AND MANUFACTURERS. Telegrams: "GASHOLDER."

W. J. JENKINS & CO.,
MOUTHPIECES
WITH SELF-SEALING LIDS FOR
HORIZONTAL AND INCLINED RETORTS.
RETFORD.


Gas-Generator. Air-Blower.
IMPROVED LEAD-BURNING APPARATUS.

HUTCHINSON BROS.,
GAS ENGINEERS, &c.
SPECIALITY.
LEAD WORK FOR SULPHATE OF AMMONIA PLANTS.
BEST QUALITY OF MATERIAL AND WORKMANSHIP.
SATURATORS, all Lead, or Strong Sheet Lead, in Wood Casing,
ACID TANKS, ELEVATORS, AND COCKS. LIQUOR AND LIME PUMPS OR INJECTORS.
Liquor-Cocks, Gauge Fittings, and Safety-Valves in Cast Iron.
HYDROMETERS, TEST-JARS (GLASS OR LEAD), COPPER SCOOPS, &c., &c.
IMPROVED LEAD-BURNING APPARATUS.
LEAD BURNERS SENT OUT TO REPAIRS.
FALCON WORKS, BARNSLEY.
Telegrams: "HUTCHINSON BROS., BARNSLEY."

PENNY-IN-THE-SLOT GAS-METERS,

SHILLING-IN-THE-SLOT METERS.

Every Description of ORDINARY GAS-METERS.

THE AUTOMATIC GAS-METER (1895) CORPORATION, LTD.

ROCK METER WORKS,

TORTWORTH STREET, STRANGEWAYS, **MANCHESTER.**

GOOD & SPENCER'S PATENTED METHOD OF SCURFING RETORTS.

April 10, 1897.

THE REVISED CHARGE FOR ROYALTY is 10s. per Annum for a make up to 15 million cubic feet; and above that, 8d. per million cubic feet.

For Particulars and License, apply to

J. E. & S. SPENCER,
14, GREAT ST. THOMAS APOSTLE, LONDON, E.C.

NOTICE IS HEREBY GIVEN, that after this date any Gas Company, Corporation, or Firm using their Method for Cleaning Retorts without holding a License will be prosecuted.

£5 REWARD will be paid to any Person who gives such Information to the Patentees that secures a conviction.

JOSEPH EVANS & SONS, CULWELL WORKS, WOLVERHAMPTON.

Telegrams: "EVANS, WOLVERHAMPTON." **PLEASE APPLY FOR CATALOGUE No. 8.** National Telephone No. 7039.

12,000 PUMPS IN STOCK AND PROGRESS.

TRADE MARK.

NO TAPPETS.

Fig. 703. "SINGLE RAM" STEAM-PUMP.

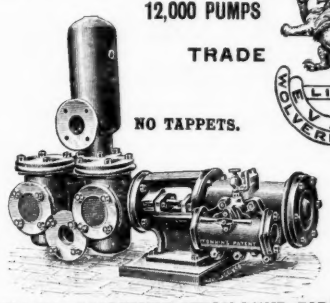


Fig. 598. "CORNISH" STEAM-PUMP FOR BOILER FEEDING, &c.

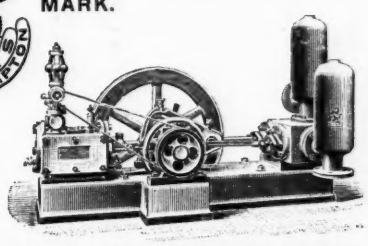


Fig. 685. "RELIABLE" STEAM-PUMP FOR TAR AND THICK FLUIDS.

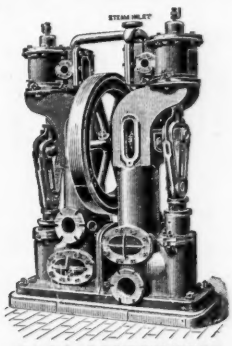


Fig. 712. "DOUBLE-RAM" STEAM-PUMP

MOBBERLEY & PERRY STOURBRIDGE.

Manufacture & supply best quality of

Gas Retorts (SEGMENTAL, HORIZONTAL, or INCLINED.)

Special Bricks & Blocks for GENERATOR & REGENERATOR FURNACES.

FIRE BRICKS, LUMPS, & TILES, BLUE STAFFORDSHIRE VITRIFIED BRICKS FOR PAVING, &c., &c.

EVERY REQUISITE FOR GAS-WORKS. Retort Setters sent to any part of the Kingdom.

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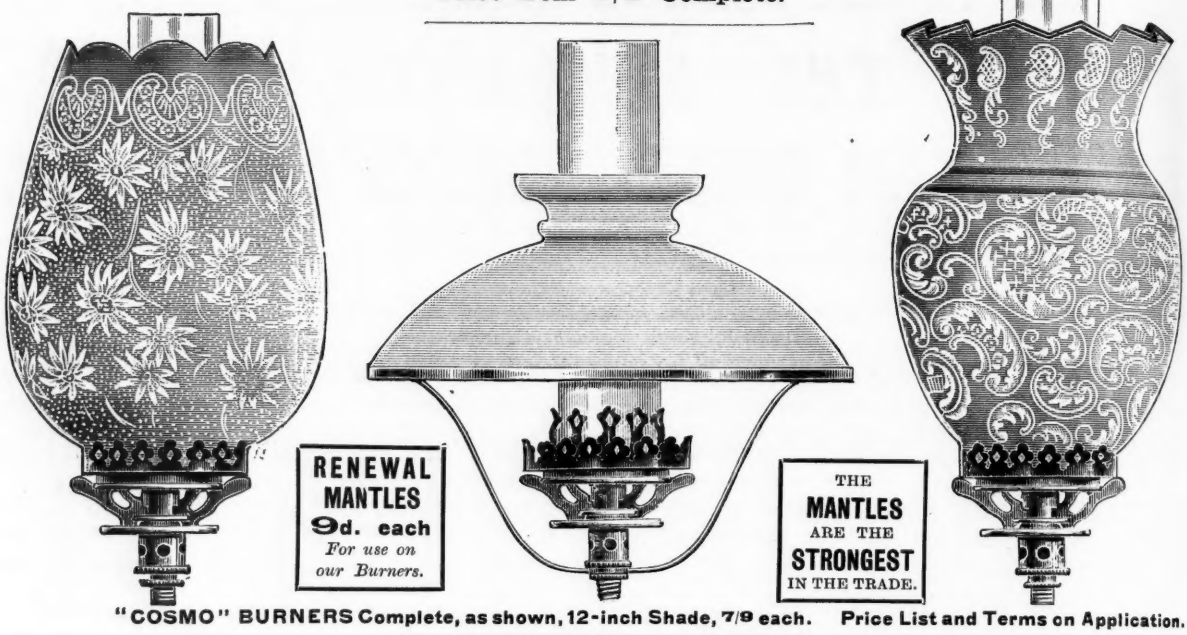

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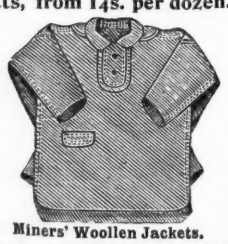

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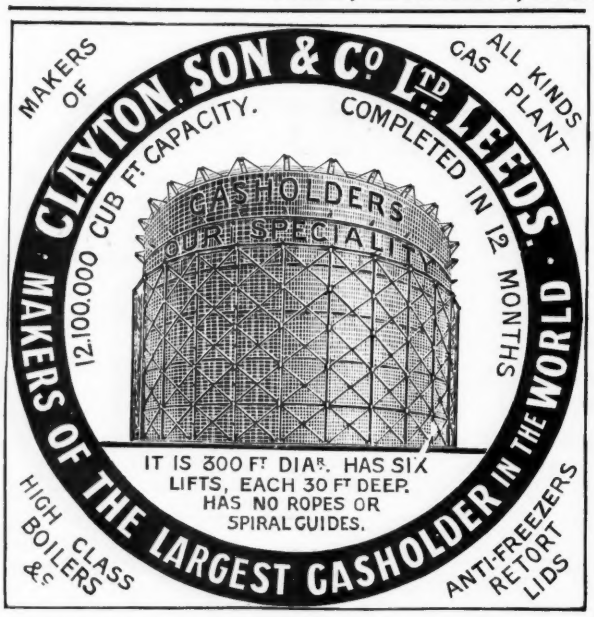
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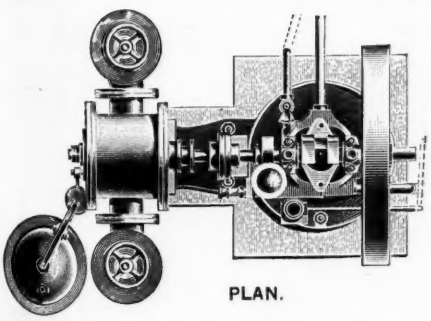
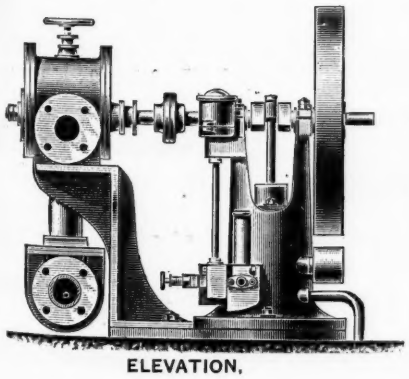


PLAN.



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